

**INTERNATIONAL
PETROLEUM
ENCYCLOPEDIA**

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INTERNATIONAL PETROLEUM ENCYCLOPEDIA

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Production, consumption trends

Table 2

	1970	1980	1985	1990	1995	Average annual growth rates		
	Million tons oil equivalent					1970-80	1980-90	1980-95
						Percent		
PRODUCTION								
Oil importing developing countries								
Oil*	63	66	105	130	145	0.4	7.1	5.4
Gas	14	27	46	86	116	6.9	12.3	10.1
Subtotal	77	93	151	216	261	1.9	8.3	7.1
All developing countries								
Oil*	774	919	1,068	1,253	1,385	1.7	3.1	2.7
Gas	52	116	184	309	424	8.2	10.3	9.0
Subtotal	826	1,035	1,252	1,562	1,809	2.3	4.2	3.8
CONSUMPTION								
Oil importing developing countries								
Oil	223	361	381	450	551	4.9	2.2	2.9
Gas	12	25	45	82	120	7.8	12.2	11.0
Subtotal	235	386	426	532	671	5.1	3.3	3.8
Self-sufficiency (%)								
	33	24	35	41	39			
Oil	355	626	664	782	954	5.8	2.2	2.8
Gas	47	95	135	226	324	7.2	9.0	8.5
Subtotal	402	721	799	1,008	1,278	6.0	3.4	3.9
Surplus (%).....	105	43	57	55	42			

*Includes natural gas liquids and oil production from secondary recovery techniques.

Source: United Nations J Series and preliminary World Bank estimates.

Petroleum investment requirements*

Table 3

	Oil importing developing countries		Oil importing developing countries	All developing countries	Annual average, all developing countries 1982-92
	Low income	Middle income			
	Billion 1982 constant \$				
Oil investment†.....	49.2	83.8	319.5	452.5	41.1
Gas investments§.....	23.9	25.2	51.3	100.4	9.2
Export facilities.....	0.0	4.7	15.4	20.1	1.8
Subtotal.....	23.9	29.9	66.7	120.5	11.0
Total investments.....	73.1	113.7	286.2	573.0	52.1
Of which foreign exchange cost.....	55.0	60.5	276.1	391.6	35.6

*Cumulative 1982 through 1992. †Includes maintenance of oil fields, enhanced oil recovery, pipelines, and infrastructure. §Exploration, development, transmission, distribution, and maintenance.

Source: Preliminary World Bank estimates.

can countries have only one well drilled in several thousand square kilometers. Examples are Mali with one well/162,000 sq km and Sudan with one well/112,000 sq km.

Production boost. The World Bank estimates that oil importing developing countries could boost their petroleum production about 7%/year to about 261

million tons (1.9 billion bbl) of oil equivalent by 1995 from 77 million tons (562.1 million bbl) in 1970.

Such an increase is technically feasible, assuming that financial resources are found and fundamental oil policy issues are resolved, Dennis Carpio of the bank's energy division told a National Association of Petroleum Invest-

ment Analysts meeting in New York during March 1983.

Carpio said exploration production investment will have to average \$52 billion year in constant 1982 dollars during the remainder of the 1980s if developing countries' production is to reach 216 million tons of oil equivalent by 1990 (Tables 2 and 3).

The World Bank expects about half of the estimated production increase to come from developed reserves, about one-third from reserves discovered but not yet developed, and the rest from new discoveries.

Most gas production will come from already discovered reserves that are underused because of market constraints and lack of transmission distribution facilities.

Carpio said, "The issue is not whether international oil companies will have adequate internal cash generation for investments, but rather whether all the lending agencies and the oil companies together can develop a program that can meet these enormous financing requirements."

World Bank is experimenting with a new type of cofinancing arrangement, the B-loan syndication instrument.

In a 2 year experiment, the bank will commit as much as \$500 million for participation in parallel commercial bank syndicated loans for petroleum and other projects. The arrangement is intended to provide longer maturities to developing country borrowers than are normally available.

Traditional parallel cofinancing arrangements involve separate commercial banks, export credits, and other multilateral or bilateral institution loans to a project financed by the bank.

The bank has earmarked one-fourth its lending through 1987 for a range of energy projects. It is helping developing countries map strategies "that take account of the need to offer international oil companies a contractual and operating environment that is attractive, stable, and consistent with developing countries' interests."

The World Bank, operating through the International Bank for Reconstruction and Development, has been in operation since June 1946. Its membership is made up of 144 governments around the world.

The main purpose of the bank is to promote economic development of its member countries to foster long term growth of international trade and improved standards of living. Its main activity is providing loans for a wide range of specific projects and related technical assistance.

Growth of lending. Since fiscal 1978, when World Bank directors first agreed to expand assistance for energy development, lending by the bank

LESS-DEVELOPED COUNTRIES

Table 4

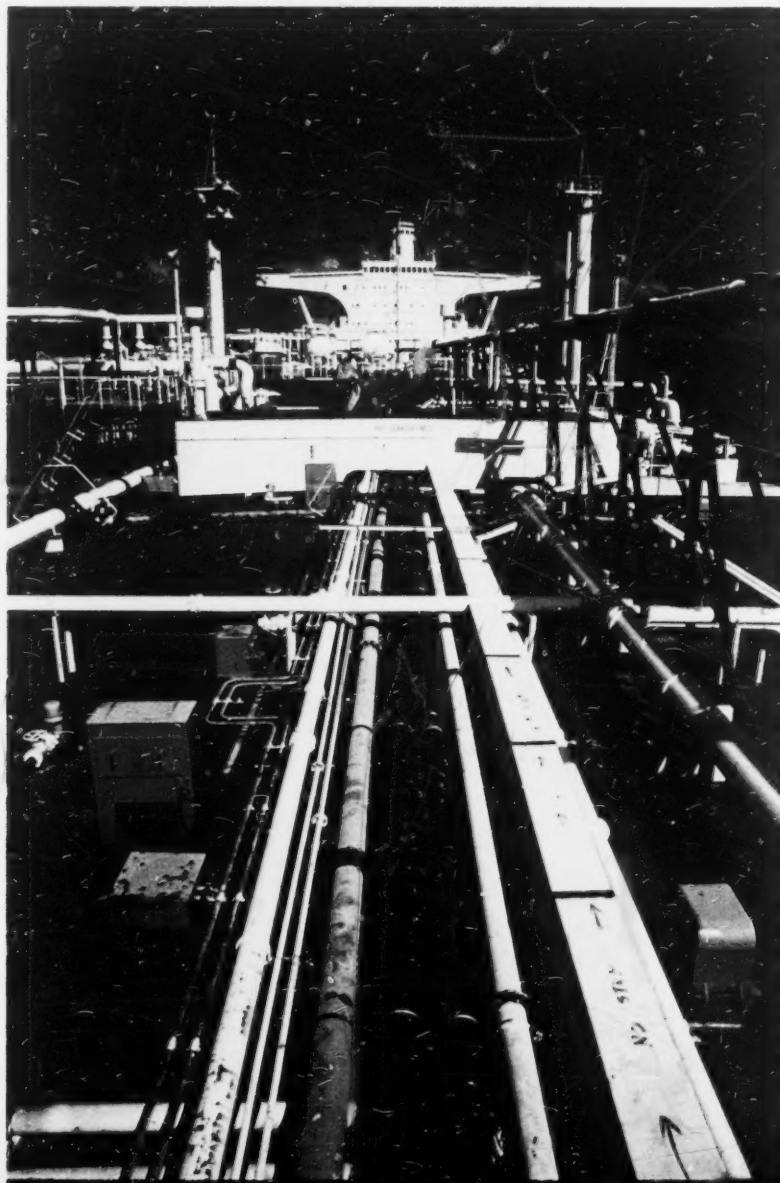
World Bank lending for energy projects

	1976-78*		1979-82*		1983	
	Number of projects	Amount†	Number of projects	Amount†	Number of projects	Amount†
Electrical power	56	3,047	80	7,201	15	1,758
Oil and gas	3	210	43	1,686	17	1,037
Predevelopment	—	—	(26)	(290)	(11)	(371)
Development	(3)	(210)	(17)	(1,396)	(6)	(665)
Coal	1	10	5	309	3	18
Other	—	—	7	710	5	161
Total	60	3,267	135	9,906	40	2,974
Percent of total World Bank lending	8.9	14.8	13.6	21.2	16.4	20.5

*Fiscal years. †Million U.S. dollars.

Source: World Bank

PHILIPPINES' newest producing oil field, Amoco's Cadiao, produces into this tanker, which makes up part of early production system off Northwest Palawan.



has increased rapidly. By the end of fiscal 1983, energy lending amounted to \$14,036 billion, equal to 20.1% of total commitments.

Energy loans during fiscal 1983 amounted to \$2,974 billion for 40 projects (Table 4).

Lending for electrical power formed the largest part of the bank's energy program. This trend is expected to continue during the next 15 years, even through bank loans amounted to less than 5% of the investment programs they supported, compared with 30% during the 1960s.

However, it was the lending commitments in the oil and gas sector that showed the most rapid increase.

Since fiscal 1978, \$2,723 billion has been committed for oil and gas projects in more than 50 countries.

Exploration promotion projects, designed to assist in collection of data and promotion of petroleum exploration by international oil companies, accounted for the largest number of projects.

By dollar volume, hydrocarbon development loans were the most important, the bank said in its 1983 annual report.

In addition to lending for traditional projects in petroleum, power, coal, and forestry, the bank's program also supported less conventional projects as a means of developing alternative sources of energy.

In Brazil, for example, a \$250 million loan is helping to develop a national fuel alcohol program.

Kenya, Philippines, and Yugoslavia obtained assistance for exploration and development of geothermal energy.

In Morocco, a \$20 million loan is being used to test alternative means of exploiting the country's enormous resources of oil shale.

Other unusual projects that have been supported by the bank through technical or financial assistance include peat resources, biogas plants, and promoting development of solar, wind, and biomass energy.

As World Bank loans increased, so did cofinancing of bank supported projects by aid agencies, export credit agencies, commercial banks, and others.

During fiscal 1979-82, \$11.2 billion of cofinancing was associated with \$9.9 billion of World Bank funds. The highest degree of cofinancing is in oil and gas projects, whose financing plans anticipate that every \$1 portion of a World Bank loan will be matched by \$1.78 from external cofinanciers.

U.S., Canadian programs. Other programs designed to assist LDCs are conducted by Overseas Private Investment Corp. (OPIC), a U.S. government agency that provides political risk in-



rural Thailand road on way to conduct geophysical surveys for Phillips Petroleum Co. during 1982. (Photo courtesy Phillips Petroleum Co.)

foreign exchange to meet interest payments falling due as international bank lending dried up. About 80% of their 1982 export earnings was needed to service their debt.

LDC debt rescheduling operations mounted in number and volume. Sovereign debt rescheduling in 1979 amounted to \$4.9 billion. During first half 1982, before Mexico, Brazil, Argentina, and others undertook the process, debts rescheduled reached \$27.9 billion.

OPEC members, too, were caught in the high debt service trap.

In 1982 OPEC as a group shifted from a net lending position to that of net borrower on international money markets.

Between 1972 and 1980 the high absorbers among OPEC members—Algeria, Indonesia, Nigeria, and Venezuela—increasingly resorted to international markets as borrowers. With large populations, ambitious develop-

Table 5

Implications of a \$28/bbl oil price for 12 nations

	Billion U.S. \$*	Decrease in net oil imports in 1983	
		Percent of 1982 imports†	Percent of 1982 GNP
Argentina	0.0	0.0	0.0
Brazil	1.4	8.0	0.5
Chile	0.1	1.6	0.3
Colombia	0.1	1.1	0.1
South Korea	1.0	4.7	1.5
Philippines	0.3	4.1	0.8
Taiwan	0.6	3.1	1.2
Thailand	0.4	6.1	1.1
Ivory Coast	0.1	3.3	1.0
Morocco	0.2	4.0	1.1
Israel	0.3	2.3	1.2
Turkey	0.5	8.4	0.9

*Reduction of 15% in 1982 net oil imports value before volume adjustment. †Goods and services, excluding oil and interest.

Source: Morgan Guaranty Trust Co.



NORTH AMERICA

United States

Area: 3,608,672 sq miles

Population: 232,616,497

Capital: Washington, D.C.

Monetary unit: Dollar

THE U.S. PETROLEUM INDUSTRY entered 1984 amid a persistent surplus of oil and gas, largely the result of economic recession and consumer resistance to high prices.

However, demand for petroleum products was rising slowly.

The American Petroleum Institute (API) in mid-November 1983 gave this sketch of the country's petroleum situation:

- Total domestic oil products supplied in October 1983 rose 1.5% above year ago levels, mainly due to a late month surge in deliveries. Domestic products supplied totaled 15.077 million b d, up from 14.86 million b d during October 1982. October 1983's increase followed a 0.5% rise in September and a 1.6% increase for the third quarter, compared with the same periods of 1982.

- Gasoline consumption had maintained meaningful year to year increases for the preceding several months, including a 3.5% increase in October 1983 deliveries to an estimated 6.614 million b d.

- Demand for distillates—diesel fuel and home heating oil—also had been growing. It rose 2% in October 1983 to a level of 2.624 million b d, compared with the same month in 1982.

- U.S. crude oil production declined marginally, by 0.4%, from the October 1982 volume. It was estimated at 8.67

million b d.

- Crude oil imports, which stood at 3.399 million b d in October were down 1.6% from year ago levels. But products imports, at 1.809 million b d, were 10.6% higher.

- Drilling activity continued to increase in October, rising 4% on a seasonally adjusted basis from the previous month to a level almost equal to that of October 1982.

API said, "While petroleum demand no longer is deteriorating, it has not experienced as robust a recovery as some industry analysts expected or as the upward momentum of economic indicators had seemed to imply.

"In addition, demand recovery has been uneven and selective. The weakness in demand has been mirrored in crude and products markets, with prices of major crudes weakening somewhat in recent weeks and prices of most major products steady or moving lower."

The API statement followed calculations that showed consumption of petroleum products in the U.S. fell 5.5% to 15.2 million b d during 1982, continuing

a trend that started in 1979. Gasoline consumption was off a little more than 1% for the year at 6.5 million b d, partly as a result of a 6% drop in December. Distillate deliveries were down 5.3%, and residual fuel oil consumption plunged 20.5% (Table 1).

A warning. Adequate supplies of energy are weakening the U.S. resolve to prepare for the future, API warned in September 1983. "The U.S. risks slipping back toward its dangerous position of the 1970s," the institute said.

The long term U.S. energy outlook remains unsettled despite considerable domestic energy progress and the adequacy of current world supplies.

Department of Energy (DOE) projections show the U.S. can continue to produce crude oil at a rate of about 8 million b d until 2000. But doing that will require rapid accomplishment of a great deal of work. For example, by the end of the century more than 75% of the domestic oil the U.S. will need must come from fields that have not yet been found (Fig. 1).

Oil supplies will be harder to find and

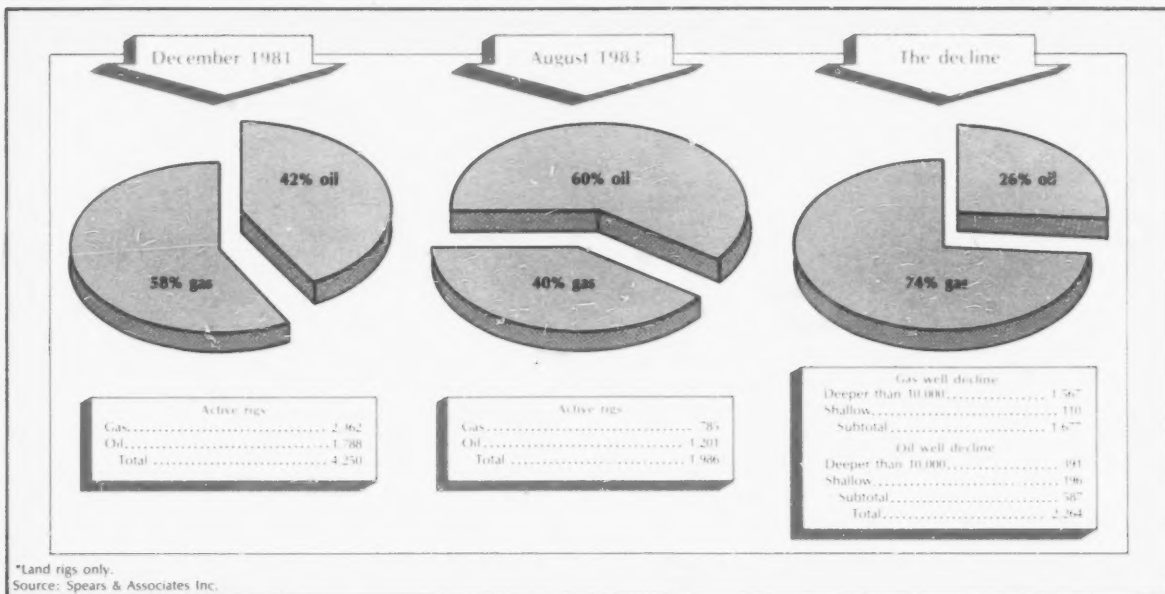
Table 1

U.S. oil supply/demand

	1981	1982	Percent change
	Million b d		
Supply			
Crude production	8.6	8.7	+ 1.0
Crude imports	4.1	3.3	- 20.1
Products imports	1.6	1.5	- 3.9
Total	16.5	15.7	- 4.8
Demand			
Motor gasoline	6.6	6.5	- 1.3
Distillate fuel oil	2.8	2.7	- 5.3
Residual fuel oil	2.1	1.7	- 20.5
Total	16.1	15.2	- 5.5

Source: American Petroleum Institute

Breakout of the collapse in the U.S. active rig count*



more costly to produce, API pointed out. If discovery rates falter, the U.S. once again could become too dependent on imported oil and thus more likely to experience higher prices and possible shortages.

"Widespread inertia and reluctance to face now the problems of the future are not enhancing prospects for future energy security," API declared.

Solutions such as natural gas decontrol, drilling access to more offshore and onshore federal acreage, fair taxation, and more rational, balanced environmental regulations had not been adopted, it added.

There had been a dramatic, rapid improvement in the nation's energy situation since the late 1970s, API said—an

improvement powered by crude oil price decontrol.

That return to a market pricing system for oil, a policy initiated by President Carter in 1979 and completed by President Reagan in 1981, helped induce energy conservation and slow the production decline of key fuels such as oil.

"An oil supply cushion exists in the world today, and any serious supply problem in the immediate future appears to be extremely unlikely," API said.

"On the other hand, the long term future is much less certain. The national energy climate is unsettling. Lethargy and complacency have returned. Memories are short. The sense of urgency that existed in Washington and among

the public has largely vanished.

"Despite the oil discoveries of the past decade and drop in oil consumption rates for more than a decade, the world has been consuming more oil than it has been finding. There is no evidence that this trend is about to reverse itself."

API also made these other main points:

- While the current excess of world oil productive capacity is large—the surplus averaged about 15 million b/d during first quarter 1983—it could be reversed swiftly.

- Oil continues to account for about one-half the energy Americans use. Despite recent progress, imported oil still represents nearly one-third of total U.S.

Table 2

Breakout of U.S. new field discoveries by size

						Reserve groups*	
	A	B	C	D	E	F	Total
1974	0 (0) [0]	1 (1) [2]	7 (3) [6]	88 (81) [87]	707 (640) [583]	2 (7) [0]	805 (732) [678]
1975	3 (4) [3]	1 (1) [2]	6 (5) [7]	100 (95) [107]	759 (712) [656]	7 (10) [0]	876 (827) [775]
1976	1 (2) [3]	0 (0) [2]	3 (9) [11]	115 (105) [92]	867 (782) [826]	0 (0) [0]	986 (898) [934]
1977	0 (3)	1 (2)	3 (4)	124 (111)	874 (751)	2 (0)	1,004 (871)
1978	1 (1)	0 (3)	5 (6)	93 (87)	879 (773)	5 (0)	983 (870)
1979	0 (0)	1 (1)	8 (7)	34 (57)	1,114 (1,067)	5 (0)	1,162 (1,132)
1980	0	1	7	31	1,301	0	1,340
1981	0	1	10	45	1,364	0	1,420
1982	0	3	5	36	1,357	1	1,402

*Estimated recovery from A fields is more than 50 million bbl of oil or 300 billion cu ft of gas, B fields 25-50 million bbl or 150-300 billion cu ft, C fields 10-25 million bbl or 60-150 billion cu ft, D fields 1-10 million bbl or 6-60 billion cu ft, E fields less than 1 million bbl or 6 billion cu ft, and F fields abandoned as noncommercial. () After 3 year review. [] After 6 year review.

Source: American Association of Petroleum Geologists.

U.S. reserves additions from exploratory drilling

Table 3

	1980	1981	1982
	Million bbl of oil equivalent		
23 MAJOR COMPANIES*			
As booked	1,636	1,857	1,587
Adjusted for royalties	1,909	2,167	1,852
Total	3,944	4,894	NA
	%		
23 MAJORS SHARE OF TOTAL			
As booked	41	38	NA
Adjusted for royalties	48	44	NA

*Amerada Hess, Atlantic Richfield, Champlin, Cities Service, Coastal Corp., Cenoco, Diamond, Shamrock, Exxon, Getty, Gulf, Marathon, Mobil, Murphy, Pennzoil, Phillips, Shell, Standard of California, Standard of Indiana, Standard of Ohio, Sun, Tenneco, Texaco, and Union of California.

Source: Petroleum Industry Research Foundation Inc.

Outlook for U.S. refining capacity

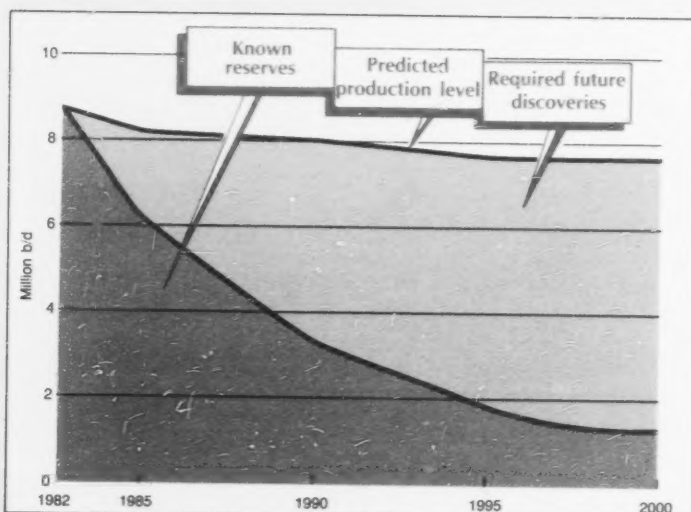
Table 4

Refinery processes	Jan. 1978 actual	Jan. 1982 actual	Jan 1984 project.	Projected 1985 need	Projected 1990 need
	Million b sd				
Crude oil distillation	18.0	19.0	18.4	18.0	18.0
Vacuum distillation	6.1	7.2	7.3	6.1	6.1
Thermal cracking	1.5	1.8	1.9	1.9	2.0-2.1
Catalytic cracking	4.9	5.0	6.0	4.9-5.0	4.9-5.0
Catalytic reforming	3.7	4.0	4.1	4.4	4.9
Catalytic hydrocracking	0.8	0.9	1.0	0.8	0.9
Hydrotreating/hydro-refining	7.0	8.5	8.8	8.2-8.3	8.9-9.1

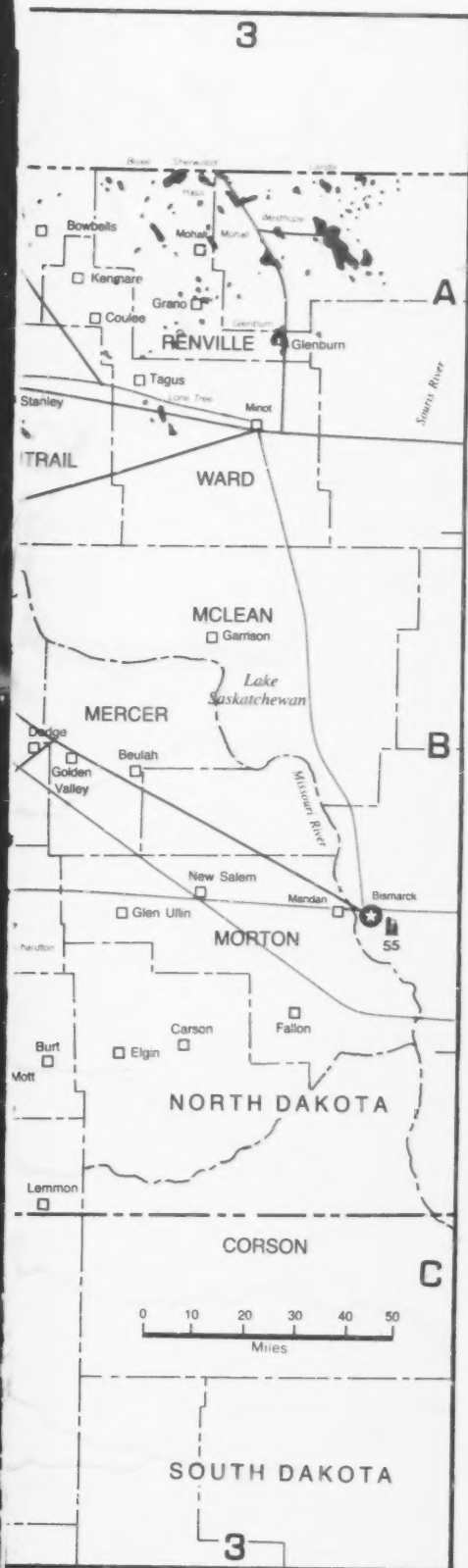
Source: General Accounting Office from National Petroleum Council and Energy Information Administration data.

The outlook for U.S. oil production

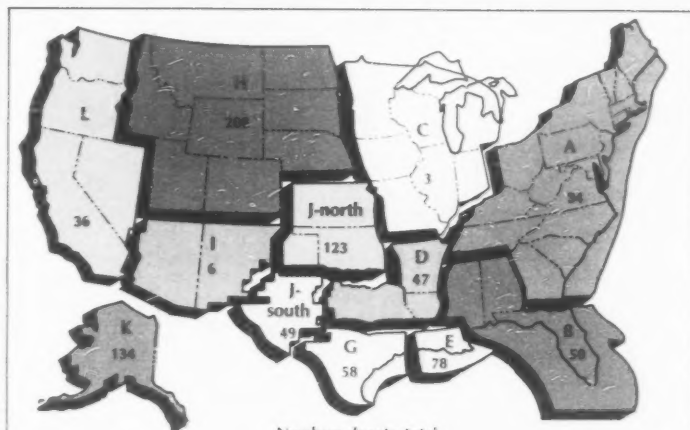
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Source: American Petroleum Institute from Department of Energy data.



Where potential gas is in the U.S.



Numbers denote total potential gas in trillion cu ft

Map key

Area		Probable	Possible	Speculative
		Trillion cu ft		
A	Onshore	2	8	33
A	Offshore	0	0	0
B	Onshore	6	6	7
B	Offshore	1	2	28
C	Onshore	0	2	1
D	Onshore	8	20	19
E	Onshore	6	15	0
E	Offshore	21	36	0
G	Onshore	12	15	4
G	Offshore	11	16	0
H	Onshore	2	3	1
I	Onshore	2	3	1
J-north	Onshore	24	80	39
J-south	Onshore	15	33	1
L	Onshore	2	8	8
L	Offshore	0	9	9
L	Lower 48	184	326	232
K	Onshore	6	16	28
K	Offshore	2	13	69
Total U.S.		192	355	329

*Less than 500 billion cu ft.
Source: Potential Gas Committee.

Congress, might ease the strain, but significant liabilities would remain.

During 1982-1985, pipelines' liabilities would be \$2.2 billion in 1983 dollars if take or pay liabilities were limited to 75% of deliverability, \$4.3 billion at 60%, and \$4.8 billion at 50%.

According to the Ingaa survey, carrying costs for take or pay prepayments will peak in 1985 at \$820 million. The total for 1982-84 will be \$1.94 billion in 1983 dollars.

Transmission companies, meanwhile, were experimenting with their marketing operations in order to sell some of the surplus gas.

For example, Panhandle Eastern Corp. launched an industrial sales program (ISP), in effect a spot market for gas sales to industrial customers, similar to the one begun in May by Transcontinental Gas Pipe Line Corp.

Unilateral cancellation of some gas

purchase contracts by transmission companies spawned a rash of lawsuits by producers seeking to hold purchasers to contract terms.

Late in 1983 Panhandle Eastern unilaterally suspended its purchases of Algerian LNG until the company's gas surplus has been depleted.

As a result of that action, a Panhandle spokesman said, the company would moderately increase gas purchases from some U.S. producers, particularly those operating in the Gulf of Mexico.

Also, Panhandle's interstate pipeline subsidiary, Trunkline Gas Co., would be able to reduce its rates by 88¢ MMBTU, representing a 19% price reduction, effective Jan. 1, 1984.

Meanwhile, Panhandle planned to begin a new round of talks with its U.S. suppliers to negotiate more takes and, in the case of some high priced gas, price reductions.

Balanced gas market. A balanced gas market would result in a dramatic increase in the number of rigs working in the U.S., said a September 1983 report by Robert B. Spears, president of Spears & Associates Inc., Tulsa.

Most of the 1982-83 collapse in the Hughes Tool Co. rig count was due to the U.S. gas surplus, Spears said. An improvement in the gas market would therefore lead the way for a boost in the rig count.

"Return to normalcy, once the gas bubble is behind us, could add 700-1,000 land rigs to the 785 now employed looking for gas," he told a Houston drilling production marketing conference sponsored by the International Association of Drilling Contractors and Petroleum Equipment Supply Association.

"These would virtually all be deeper rigs," he said. But he pointed out that "just a side glance at the rig numbers suggests there will still be idle equipment in the deep rig category after the gas bubble is over."

Spears and his partner, John R. Spears, analyzed the 1982-83 collapse in activity in order to assess the potential for future increases in drilling activity.

Spears explained that the analysis was simplified by allocating dry holes to either oil or gas, based on depth and region. Spears calculated the mix of oil and gas wells in the August count by studying rig activity within regions.

By Spears' estimate, 42% of the 4,250 land rigs active at the peak in December 1981 were on oil related prospects, and 58% were on gas related prospects.

That translates into 1,788 rigs driven by oil and 2,462 rigs driven by gas (Fig. 3).

About 62% of the active rigs at the peak were drilling to targets below 10,000 ft. Spears said 1,922 were looking for gas and 697 for oil.

"We know from the Hughes count that 1,986 land rigs are active," Spears said in his report. "That's a menacing 2,264 less than 20 months ago."

Spears said 60% of the 1,986 land rigs working in August were on oil prospects and 40% on gas prospects. Gas wells deeper than 10,000 were employing 355 rigs, oil wells 306.

Based on this analysis, 1,677 rigs were lost due to a decline in drilling for gas, compared with 587 for oil. A decline in drilling below 10,000 ft for gas dropped out 1,567 rigs, compared with 391 for oil. "Some producers have deliberately shifted their search to oil and away from gas through this period of the gas bubble," Spears said.

"Thus, the mix of oil to gas well drilling and corresponding rig count today is anything but normal. We are pretty certain the focus is more heavily

Table 1

New Canadian gas exports

Company	Volume approved	Volume sought
	Trillion cu ft	
Dome Petroleum Ltd.	2 280	3 000
TransCanada PipeLines Ltd.	2 850	6 080
Pan-Alberta Gas Ltd.	2 100	4 520
Alberta & Southern Gas Ltd.	1 280	4 370
ProGaz Ltd.	1 080	1 940
West Coast Transmission Ltd.	0 880	2 410
KannGas	0 485	0 690
Consolidated Natural Gas Ltd.	0 170	1 170
Sulpetro Ltd.	0 165	0 165
Columbian Gas Development Ltd.	0 110	0 190
Canada-Montana Gas Ltd.	0 110	0 515
Niagara Gas Ltd.	0 040	0 075
Ocelot Industries Ltd.	* nil	0 560
Total	11.550	24.685

*NEB rejected Ocelot's application to export gas from Saskatchewan on the grounds that no agreement had been reached between Saskatchewan and Alberta to share the export revenue. Because Saskatchewan buys Alberta gas for its own needs, Alberta said it wanted a share in potential export revenues earned by Ocelot.

Source: National Energy Board.

refinery demand drops because of seasonal maintenance programs.

NEB's decision was a response to demands from western Canada oil producers for new export approvals because of large numbers of shut-in wells.

Canada virtually eliminated exports of light crude in the late 1970s to U.S. markets because of declining domestic production and increasing reliance on imported oil.

NEB said preference was to be given to exports of light sour crude, but some applications were expected for sweet crude.

Canada had been importing about 280,000 b/d of oil during the preceding 3 months, but imports had been reduced to the minimum required under contractual obligations.

The federal government asked refiners to cut imports and provided transportation subsidies for western Canada oil shipped to refiners in eastern Canada.

NEB approved exports of about 200,000 b/d of heavy crude oil to the U.S. which could not be processed in Canadian refineries. In January 1983 NEB approved exports of 9,000 b/d of light sour crude from Saskatchewan, but only 5,000 b/d were delivered to U.S. refiners. There was shut-in production of 5,000-10,000 b/d of light sour crude in the Estevan area of Saskatchewan.

Pressure for new light crude exports came mainly from Alberta, where shut-in of light crude production in January 1983 totaled 180,000 b/d.

A report by the Alberta Petroleum Marketing Commission, the provincial agency which markets oil and gas, said shut-in volumes of light and medium

crude in Alberta averaged 58,000 b/d in 1982 for a total of 21 million bbl. Shut-in volumes peaked in April 1982 at 326,000 b/d.

Prior to the NEB announcement, industry sources were predicting average shut-in volumes in Alberta during 1983 of 75,000-100,000 b/d of light to medium crude.

New exports approved. NEB approved several new applications for additional oil exports in mid-1983.

Dome received approval to ship 425,000 bbl of Alberta crude oil to Japan. The spot contract sale was the first purchase by Japan of Canadian oil and the first significant oil export approved by Canada since 1979.

Dome negotiated the sale with Marubeni Corp., a major Japanese trading company. The sale was worth about \$4 million.

The Canadian industry at that time had shut-in productive capacity of about 200,000 b/d.

NEB later approved more spot exports of crude oil to Asian countries.

Imperial Oil Ltd., Toronto, received approval for sale of 470,000 bbl of crude oil to Japan or South Korea.

NEB also approved several applications for export of light crude to the U.S. Northridge Oil & Gas Ltd. was scheduled to export 3,500 b/d during May-December. Petro-Canada was granted approval for exports of as much as 20,000 b/d during May.

Gas price cut. In April 1983 Canada cut its uniform price to U.S. customers by 11% to U.S. \$4.40/MMBTU from \$4.94. The cut was made under the 3 year old Duncan-Lalonde formula, an agreement between the two countries

which tied the export price of gas to a percentage of the landed price of crude oil at Montreal. The gas price cut was triggered by a \$5/bbl slide in oil prices.

Then early in July, the Canadian government moved again and introduced a volume discount price of U.S. \$3.40/MMBTU for U.S. customers who bought volumes in excess of 50% of NEB licensed volumes or any volume in excess of licensees' shipments from Nov. 1, 1981, to Oct. 31, 1982, whichever was less.

The discount price program, in effect until Oct. 31, 1984, had been promoted by Alberta, gas producers and industry associations such as the Independent Petroleum Association of Canada (IPAC) and Canadian Petroleum Association (CPA).

The industry also wanted Canadian marketing policy to become more flexible, with prices based mainly on negotiations between buyers and sellers and tailored to conditions in specific U.S. markets.

Ottawa and Canadian producers hoped the changes in marketing strategy would be sufficient to retain Canada's share of the U.S. gas market and prevent further erosion of sales.

Contract renegotiation. The extent of the drop in the market for Canadian gas was underscored by actions of major gas marketing firms such as Pan-Alberta Gas Ltd. and TransCanada PipeLines Ltd. They had been forced to renegotiate contract terms with their U.S. customers.

Pan-Alberta began to negotiate early in 1983 when one of its major customers, United Gas Pipe Line Co., said it would invoke a force majeure clause in its contract to cut its minimum purchase obligation to 150 MMcf/d from 325 MMcf/d.

Pan-Alberta also sold gas to Northwest Alaskan Pipeline Co., which in turn sold it to four other U.S. transmission companies. The gas was shipped via the eastern and western legs of the prebuild section of the Alaska gas pipeline.

Pan-Alberta agreed to cut its minimum purchase obligation for its U.S. customers to 40% of contract volume from 72%, although buyers were required to pay for 70% of the contract volume whether they took it or not. The new contract arrangement were to be in effect until October 1984.

Prior to the new deal, full contract volumes were 800 MMcf/d on the eastern leg of the prebuild and 240 MMcf/d on the western leg. Those volumes were reduced to about 320 MMcf/d on the eastern leg and 96 MMcf/d on the western leg.

Canadian producers were to receive take or pay payments based on the difference between the 40% minimum purchase volume and 70% of the full

mile Block 23 06 in the South Huang Sea (South Yellow Sea) following completion of seismic surveys.

A discovery operated by Total of France and Chinese National Offshore Oil Corp. may be the most productive well so far in the South China Sea, says Xinhua News Agency.

The well flowed at rate of 8,640 b/d of crude from about 7,545 ft.

Well site is in the Gulf of Tonkin off China's Guangxi Zhuang autonomous region.

Japan China Oil Development Corp.'s exploration program in the Bohai Sea has turned up several oil and gas discoveries.

The joint venture company plans to drill 24 wells in the sea by 1986 and begin production in 1987. Initial production is expected to be 200,000 b/d.

The company has drilled another oil and gas discovery in the southern portion of China's Bohai Sea.

The strike by Japan China Oil Development Corp. brings China's plans to begin production from the area as early as 1987 one step closer. The joint venture said initial flow rate from the area is expected to be about 200,000 b/d.

In a related development, the partners agreed to boost exploration spending to \$600 million from \$210 million.

China's Xinhua News Agency reported that Japan China's discovery flowed 1,830 b/d of 27° gravity oil and 314.9 Mcfd of gas from Paleocene sandstone at about 9,840 ft.

Exact site wasn't disclosed for the well, drilled to about 13,435 ft.

Drilling began early September 1982 and was completed Dec. 29, 1982. Tests were conducted during January and early February 1983.

China National Offshore Oil Corp. drilled the well for the joint venture using the Bohai 4 jack up, rated to 25,000 ft in 300 ft of water.

The discovery is the fourth since Japan and China began the joint venture exploration program in 1980. The first three strikes, which also flowed oil and gas, were drilled in 1981.

Japan and China agreed to extend the exploration period covering Bohai Sea acreage to 7 years from the original 5 year term. That extends the program to May 1987.

Another Japan China Oil Development Corp. wildcat in the Bohai Bay flowed about 4,400 b/d of high gravity, low sulfur crude, Kyodo News Service reports.

ARCO find. The first hydrocarbon strike drilled off China by U.S.-based firms has yielded more natural gas and a little condensate in further tests.

ARCO China Inc., a unit of ARCO International Oil & Gas Co., plans to move in a second rig to delineate its Yacheng 13-1-1 gas discovery in the South China Sea. After completing tests

The outlook for drilling off China

	Yearend 1983		Yearend 1984		Yearend 1985	
	Areas under contract	Active rigs	Areas under contract	Active rigs	Areas under contract	Active rigs
Bohai Gulf	3	5-6	2	7	2	7
Yellow Sea	1	0	2-3	1-3	3-6	3-4
East China Sea		1-2		1-2		1-2
Pearl River basin	13-15	1	15-20	7-10	15-20	10-15
Tonkin Gulf	5-7	2-3	7-10	4-6	7-10	4-6
Total	21-26	9-12	26-35	20-25	27-38	25-30

*Includes platform rigs. †Ministry of Geology.

Source: China Energy Ventures Inc.

of the discovery well, ARCO China launched plans to probe another structure with the Ledong 30-1-1 wildcat 15 miles to the southwest.

The Yacheng 13-1-1 flowed a combined total of 42 MMcf/d of gas and a small volume of condensate through a choke with more than 3,000 psi surface flowing pressure on tests of two undisclosed intervals.

The flow was restricted by the size of the equipment in the well, said Paul Ravesies, ARCO International president.

ARCO China's partner is Santa Fe Minerals (Asia) Inc., a unit of Santa Fe International Corp., Alhambra, Calif. Contractor's interest is split 70% ARCO China, 30% Santa Fe.

East China Sea. China has drilled a wildcat it bills as the first commercial oil and gas discovery in the East China Sea.

The Shanghai Marine Geological Department said the well was drilled to 4,651 m (15,255 ft), "the deepest of its kind in China."

A press dispatch issued by the official Xinhua News Agency disclosed no details on flow rates, productive formations, or pay thickness.

Site of the 1 Pinghu discovery is 420 km (260 miles) southeast of Shanghai.

Chinese geologists called the strike "a major breakthrough in China's search for oil on the East China Sea continental shelf."

It is the fourth wildcat China has drilled in the East China Sea basin since 1980.

The first test discovered natural gas in 1981.

Crude production. China plans to double its crude oil production to an average 4 million b/d by 2000.

The goal will require increased exploration production efforts throughout the country, Xia Guozhi, China's vice-minister of geology and minerals, told a conference in Beijing.

Meeting the goal also will require huge amounts of capital.

China will need several hundred million dollars to service oil and gas exploration in the South China Sea, says

Chen Lizhong, manager of General Petroleum Service Corp. of the South China Sea.

The country met its 1982 crude oil production goal of 733 million bbl Dec. 24, 1982, Chinese government officials report.

It was the fifth consecutive year in which China's oil production exceeded that volume.

Average production during the year was about 2 million b/d.

Gas production met the 1982 goal of 370.7 billion cu ft Dec. 16. As of Dec. 24, gas production totaled 381.3 billion cu ft.

China produced 78.81 million tons of crude during the first 9 months of 1983, meeting its quota 13 days ahead of schedule, says the ministry of petroleum industry.

The figure is up 3.3% from the same period in 1982.

Daqing field yielded 39 million tons—76.5% of its annual target.

China produced 102.12 million tons of crude in 1982 and expected to exceed 105 million tons in 1983.

China expects stable output from Daqing, its largest oil field.

Production will remain at the present 50 million tons year through the late 1980s, said a field spokesman quoted by Xinhua News Agency.

Daqing's life will be prolonged thanks to improvements in recovery methods and discovery of more reserves in old and new formations, he said. China previously believed production would begin to decline in 1985.

China is to speed onshore exploration in northwestern basins.

A special conference, reported by the official Xinhua News Agency, discussed plans and methods for accelerating exploration over 656,000 sq miles that contain three of China's four biggest basins—Junggar, Tarim, and Qaidam—and two smaller basins, Ningxia and the Gansu Corridor.

Geologists said the northwest has potentially rich resources that could provide the country with large oil reserves.

Offshore, the Tianjin-based Bo Sea Petroleum Corp. reported that the Sino-

International seismic crew count

	1977			1978			1979		
	Land	Marine	Total	Land	Marine	Total	Land	Marine	Total
United States	282	27	309	328	24	352	382	31	413
Canada	54	2	56	82	2	84	64	2	66
Mexico	20	1	21	24	3	27	26	3	29
Central & South America	48	8	56	47	7	54	51	9	60
Europe	40	14	54	42	11	53	49	13	62
Middle East	32	3	35	39	1	40	33	2	35
Africa	73	3	76	64	10	74	53	5	58
Far East	34	9	43	49	9	58	48	14	62
Total	583	67	650	675	67	742	706	79	785

	1980			1981			1982			1983*		
	Land	Marine	Total	Land	Marine	Total	Land	Marine	Total	Land	Marine	Total
United States	502	38	540	644	45	689	512	57	569	415	44	459
Canada	75	3	78	66	5	71	63	5	68	73	6	79
Mexico	29	3	32	29	3	32	29	1	30	27	2	29
Central & South America	66	7	73	91	8	99	98	7	105	88	5	93
Europe	60	23	83	66	29	95	69	31	100	69	23	92
Middle East	40	4	44	45	4	49	43	3	46	35	2	37
Africa	64	7	71	82	7	89	70	6	76	62	12	74
Far East	59	20	79	79	13	92	103	16	119	95	13	108
Total	895	105	1,000	1,102	114	1,216	987	126	1,113	864	107	971

*First half

Source: Society of Exploration Geophysicists.

1983 annual meeting that the survey helped pick locations of the last 13 of 16 development wells drilled by that time.

All the wells, which cost \$4-5 million apiece, were successful. The 3D survey cost \$1.6 million, so if it prevented the mislocation of just one well then it paid for itself at least twice over. And the survey allowed several wells to be drilled simultaneously, which speeded development of the field.

Seismic researchers believe they have just scratched the surface of 3D capabilities. They're looking for ways to cut surveying and processing costs in order to encourage use of 3D surveys.

As application of the technique increases, new uses for the data will be found. And if 3D acquisition techniques can be improved so that broader areas can be covered, 3D surveys could become an important exploration tool.

Vertical seismic profiling. Another seismic method gaining more and more attention is the vertical seismic profile (VSP).

In a VSP survey, geophones are lowered into a wellbore to record seismic energy generated by a surface source. The method is similar to a velocity—or check shot—survey.

It differs in that geophones are grouped more closely in the VSP, and reflected energy is recorded in a VSP, along with the "first break" data that are the main objective in a velocity survey.

Because a VSP records reflected, as well as direct, energy, it provides information on horizons below the bottom of the hole in which it is conducted. If the hole is in the process of being drilled, a

VSP in effect allows the operator to "see ahead of the bit."

Data quality of VSP surveys usually is high. That's because geophones are in a "quiet" environment; that is, they're below the weathered layer of unconsolidated soil and rock near the surface. Weathering detracts from data quality.

In a VSP survey, the seismic energy must pass through the weathering only once, compared with twice in a traditional seismic survey.

Researchers are experimenting with downhole energy sources, which would allow for more geophones per shot than are possible with the geophones located in the well bore and the source on the surface.

Surveys conducted that way, however, would not provide the advantage of having the geophones in the quiet underground environment. And operators probably would be reluctant to allow detonations of sufficient strength to take place in expensive holes.

Main limitations of VSP surveys are the small area they can cover and their difficulties in mapping steeply dipping strata.

One major seismic contractor in 1983 said his firm was successfully mapping VSP lines as long as one-half the depth of the well bore. And results generally were poor in areas with steeply dipping underground formations.

An area of potential growth is use of VSP and 3D surveys in conjunction with one another.

The VSP data could be valuable in tying well and seismic data, in essence fine tuning the 3D data around a well.

And the two types of surveys could be conducted together at significant cost savings because crews could be kept busy.

Shear wave technology. An emerging area of seismic work is use of shear waves—also known as S-waves.

Most seismic work involves compressional waves—or P-waves—in which particle motion of transmitting rock is parallel to the direction of propagation of the wave.

In S-waves, the particle motion is perpendicular to propagation.

Because of this difference, S-waves can provide information about rocks through which they travel different from that provided by P-waves.

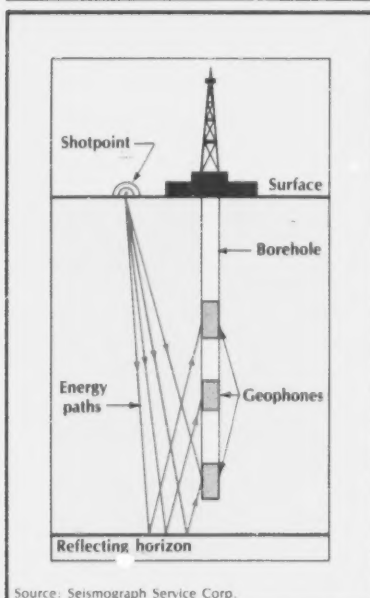
But processing S-waves is a problem. S-waves travel through rocks at about one-half the speed of P-waves, so velocity control is limited. It's difficult, therefore, to convert S-wave data to depth so they can be correlated with P-wave data.

And S-wave generation requires special equipment and techniques (see accompanying story).

There are other problems. Stuart Crampin, of the Institute of Geological Sciences in Scotland, told the SEG annual meeting that S-waves encounter more complications than P-waves on the free surface and in the weathered layer.

"Realistic" S-wave interpretation requires that recording involve geophones with three-directional components. Most seismic recording involves geophones with single, vertical components. Furthermore, S-wave wave trains are more

Vertical profiling



Source: Seismograph Service Corp.

from an assumed model with recorded seismic data. They reconstruct the model until errors between the synthetic and actual seismic data are reduced to an acceptable minimum.

To be accurate, they must have much data and dense sampling. They also must be able to manipulate the data, which requires much computer power. In the future, they'll probably incorporate S-wave data with conventional P-wave information to great benefit in seismic inversion.

Already, geophysicists are able to use this and related techniques to simulate seismic shots over a geological model to compare synthetic data with actual data as a check of interpretation accuracy.

New equipment, techniques. New types of data and new ways of looking at them have required not only quantum leaps in computer power but also new hardware and methods for acquiring data.

Innovations are legion, so only a few examples can be presented here.

One of the most obvious is the increasing number of channels used in recording seismic shots.

It's common now for crews to record on 1,024 channels, and other increases are possible.

Just a few years ago, 96 channel recording was considered a maximum.

Increasing use of the high channel techniques is assured as 3D surveys gain use. But some geophysicists think the trend will be constrained by field hardware without further innovations.

Some already are well under way.

Geophysical exploration*

	1956	1960	1965	1970	1975	1980	1981	1982
	(Crew months)							
United States	7,857	5,207	4,471	2,521	3,687	4,962	5,877	5,676
Canada	1,512	686	801	806	597	695	584	527
Mexico, Central & South America	1,206	1,180	1,127	1,052	790	645	1,261	808
Total Western Hemisphere	10,575	7,073	5,399	4,379	5,074	6,302	7,722	7,011
Western Europe	1,329	1,118	1,039	725	679	569	733	798
Africa	797	1,437	890	802	676	688	973	755
Middle East	475	334	350	286	306	346	452	480
Far East	451	564	1,180	1,009	440	520	436	473
Total Eastern Hemisphere	3,052	3,453	3,290	2,822	2,101	2,264	2,984†	2,810
Total Free World	13,627	10,526	9,689	7,201	7,185	8,566	10,706†	9,821

*Includes seismic, gravity-magnetic, and others.

†Includes crew months allocated to international waters and other areas not specifically identified.

Source: Society of Exploration Geophysicists.

Seismic crews are using telemetric recording more and more. There were a number of systems for this in use in 1983.

Some of them involve transmitters at detection points. These send data back to central recordings points. Other systems place recorders at the detection points, with radio signals used for timing.

By eliminating traditional seismic cables, telemetric recording facilitates field work.

In addition, it cuts the antenna effect of seismic cable, a phenomenon that degrades recorded data. And, in general, any survey using more than 96 recording channels must have some form of telemetric recording because cable weight becomes excessive.

Satellites also are gaining use in seismic recording. Field crews can use satellites to transmit data to central processing centers, a technique that probably will become common as companies build centers around expensive supercomputers that need to be kept busy to be economic.

At the processing and interpretation level, seismic work is becoming more and more geared to the computerization that's driving its technology.

Under rapid development is the interactive work station, a terminal with video screen at which geophysicists can manipulate data, build models, and conduct the intricate functions involved in inversion and related modelling techniques.

At such stations interpreters can give three dimensional representations of the underground, analyzing seismic sections and horizontal "time slices" from 3D surveys, using colors to identify various features.

Increasingly sophisticated color plot-

ters enable interpreters to put this type of work on paper, presenting an ever clearer picture of underground features.

The future. All these developments promise an exciting and increasingly complex future for seismic technology.

It's a technology that can save explorationists much money by preventing the drilling of misplaced holes. But it's expensive in itself, too, so a key need for the future is to cut the costs of new techniques.

Some researchers expect optical seismic sensors to find a place in data acquisition. Geophones are reliable and can be adapted to new wave types, but some in the industry still think permitting problems and other factors will dictate new ways of detecting seismic reflections.

The most commonly cited development expected in the remote sensing area is adaptation of fiber optics to seismic field work.

In addition, airborne sensors might be used to optically detect seismic responses.

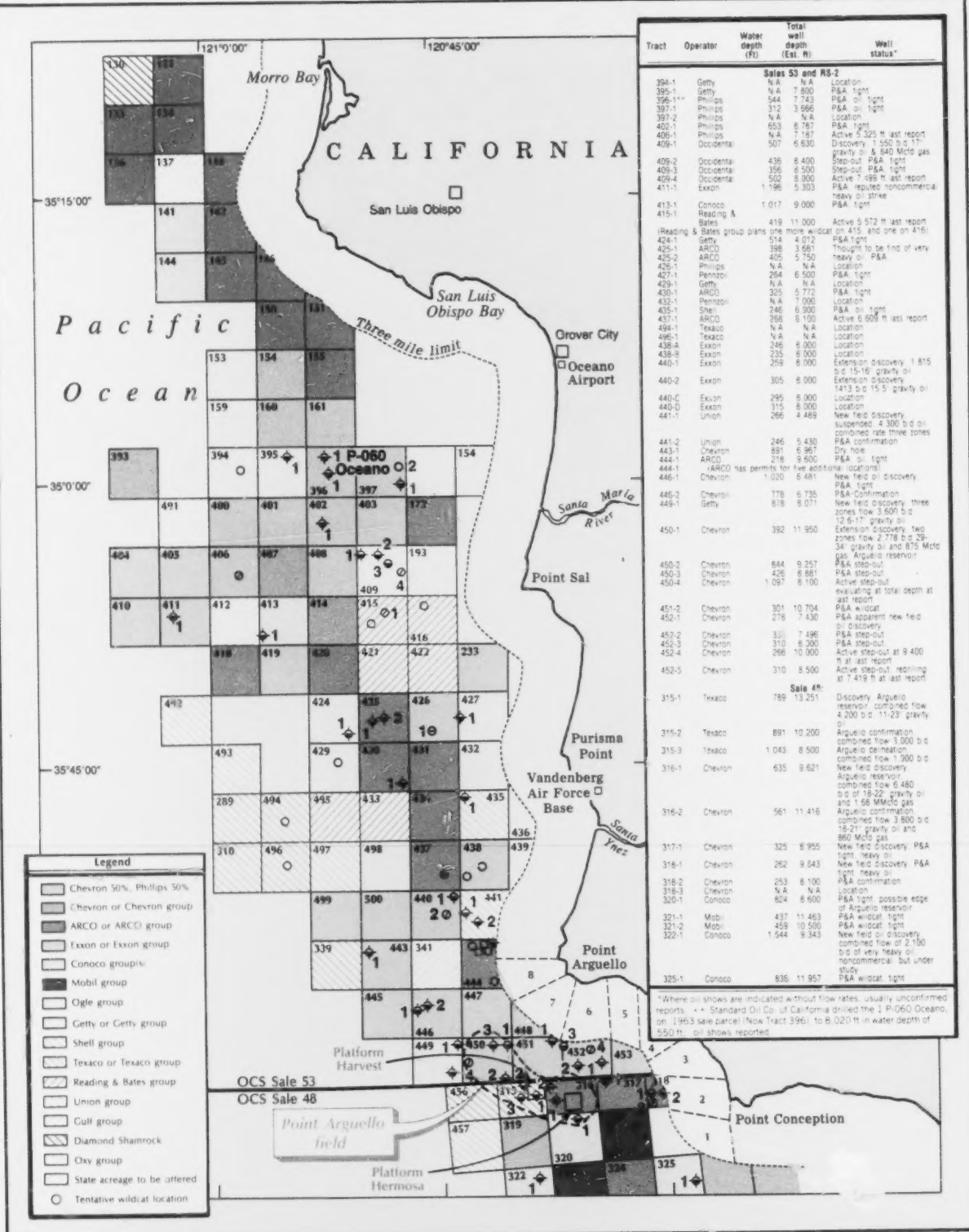
Related to that is use of co-called smart geophone arrays or other detectors that can adaptively discriminate against noise during data acquisition. This is an area of strong development.

In the more distant future, geophysicists may be able to pull together non-seismic information for use with seismic data at one work station.

Thus, an interpreter might be able to gain access to data bases covering production data, well logs, maps, and geological information for correlation with seismic data.

The different types of information thus could enhance each other, yielding information that's more reliable and more comprehensive than what's available today.

Santa Maria basin action



Worldwide oil and gas at a glance

COUNTRY	ESTIMATED PROVED RESERVES 1-1-1984		OIL PRODUCTION			No. of ref.	REFINING Capacity (b/cd) January 1, 1984			
	Oil (1,000 bbl)	Gas (10 ⁹ cu ft)	Producing wells** July 1, 83	Estimated 1983 (1,000 b/d)	% change from 1982		Crude	Thermal operations	Catalytic cracking	Catalytic reforming
ASIA-PACIFIC										
Australia	1,586,000	17,682	509	405.0	+ 9.2	12	722,100	...	174,300	174,000
Bangladesh	7,000	...	...	...	...	1	22,200	...	...	1,720
Brunei	1,390,000	7,050	649	155.0	+ 2.6	1	10,000	...	...	...
Burma	30,000	180	445	30.0	+ 3.4	2	26,300	1,700	...	...
China, Taiwan	(c)6,200	550	86	2.3	0.0	2	515,410	3,933	36,160	36,160
Guam	...	...	...	...	...	1	43,700	...	...	...
India	3,485,000	14,826	1,560	390.0	+ 1.0	12	778,699	85,571	74,350	15,060
Indonesia	9,100,000	30,200	4,840	1,292.0	- 3.5	9	387,000	18,100	11,000	17,250
Japan	58,000	900	370	6.9	-10.4	45	5,020,350	80,520	442,950	556,900
Korea, South	...	...	...	...	...	6	775,870	12,990	...	36,550
Malaysia	3,000,000	48,000	316	370.0	+ 20.9	4	205,000	...	6,300	14,000
New Zealand	(c)170,000	5,533	16	15.0	0.0	1	74,000	...	...	24,000
Okinawa	...	...	...	...	...	3	153,000	...	...	11,600
Pakistan	82,900	15,800	38	13.0	+ 8.3	3	126,450	...	...	5,060
Philippines	16,300	14	11	15.0	+ 7.1	3	286,000	...	16,100	40,200
Singapore	...	...	...	...	...	5	1,101,000	134,000	...	51,000
Sri Lanka	...	...	...	...	...	1	50,000	12,500	...	3,750
Thailand	/ 45,000	8,500	45	11.0	+83.3	...	3	176,000	12,000	8,800
Total Asia-Pacific....	18,969,400	156,235	8,885	2,705.2	+ 2.5	114	10,473,079	361,314	769,960	1,013,150
WESTERN EUROPE										
Austria	122,000	530	1,240	24.0	- 4.0	...	1	268,000	17,000	23,000
Belgium	...	...	...	...	...	5	694,100	42,500	100,200	90,900
Cyprus	...	...	...	...	...	1	15,000	...	...	3,250
Denmark	324,000	2,887	27	46.0	+31.4	3	174,000	72,500	...	30,650
Finland	...	...	...	...	...	2	299,000	45,500	37,500	48,000
France	139,780	2,422	470	32.0	- 5.9	19	2,670,400	114,600	250,300	361,100
Germany, West	304,000	6,800	3,142	81.0	- 1.2	27	2,386,250	325,600	184,500	401,350
Greece	51,000	3,470	14	25.0	+19.0	4	368,700	19,520	23,000	30,300
Ireland	...	700	...	...	...	1	56,000	...	...	14,500
Italy-Sicily	800,000	4,340	140	37.0	...	24	3,050,100	309,630	271,200	347,900
Netherlands	308,700	50,050	623	42.0	+50.0	7	1,551,500	170,900	115,000	178,900
Norway	7,660,000	58,800	144	600.0	+22.4	4	242,700	67,000	...	29,000
Portugal	...	...	...	...	...	2	281,882	...	...	38,169
Spain	160,000	2,225	41	59.0	+96.7	10	1,493,000	94,400	63,500	195,700
Sweden	...	...	...	...	...	6	452,800	69,000	...	81,900
Switzerland	...	4	...	...	...	2	137,000	24,000	...	25,000
United Kingdom	13,150,000	25,100	387	2,260.0	+ 9.6	16	2,091,500	177,000	341,000	369,500
Total Western Europe	23,019,480	157,328	6,228	3,206.0	+ 12.7	134	16,231,932	1,549,150	1,409,200	2,275,119
MIDDLE EAST										
Abu Dhabi	30,400,000	20,500	222	757.0	-12.0	3	185,250	...	...	12,334
Bahrain	185,000	7,400	243	41.0	- 6.8	1	250,000	19,000	34,200	17,100
Divided (Neutral)	...	...	...	...	...	...	...	...	...	...
Zone	5,695,000	8,307	450	398.0	+ 30.5	...	...	...	...	...
Dubai	1,440,000	4,320	165	327.0	- 8.1	...	...	...	...	...
Iran	51,000,000	480,000	530	2,606.0	+30.4	4	530,000	80,800	...	63,845
Iraq	43,000,000	29,000	290	905.0	- 1.0	7	168,500	...	...	5,000
Israel	800	10	16	0.2	0.0	2	190,000	48,000	15,000	24,300
Jordan	...	...	...	...	...	1	100,000	...	4,410	8,640
Kuwait	63,900,000	31,000	530	912.0	+ 36.7	5	622,800	...	...	48,120
Lebanon	...	...	...	...	...	2	52,000	...	7,250	7,292
Oman	2,790,000	2,810	477	378.0	+17.4	1	48,082	...	...	9,644
Qatar	3,330,000	62,000	125	270.0	-18.2	1	63,200	...	...	11,830
Saudi Arabia	166,000,000	121,000	555	4,872.0	-23.4	4	860,000	...	10,000	38,000
Ras al Khaimah	(c)100,000	400	...	...	...	...	...	...	...	...
Sharjah	400,000	6,000	12	35.0	+169.2	...	...	...	...	...
South Yemen	...	...	...	...	...	...	...	...	...	...
(Aden)	...	...	...	...	...	1	130,000	...	...	8,000
Syria	1,490,000	1,290	601	165.0	+ 3.1	2	228,790	41,199	...	19,348
Turkey	370,000	1,010	427	45.0	-10.0	4	472,460	...	41,260	43,875
Total Middle East	370,100,800	775,047	4,643	11,711.2	- 5.4	38	3,901,082	188,999	112,120	317,328

EDITOR'S NOTE: All reserves figures except those for the U.S.S.R. (and gas for Canada) are reported as proved reserves recoverable with present technology and prices. U.S.S.R. figures are "explored reserves" which include proved, probable, and some possible. Canadian gas figure, under criteria adopted by Canadian Petroleum Association in 1980, includes proved and some probable. *Condensate. **U.S. reserves numbers based on Energy Information Administration estimates which ran some 3 billion bbl and 11 trillion cu ft higher than API/AGA estimates for 1979, the last year the latter two associations provided estimates. †Estimates based on capacity as of Jan. 1, 1983, plus known 1983 closures and expansions. ‡Includes Albania, Bulgaria, Cuba, Czechoslovakia, East Germany, Hungary, Mongolia, North Korea, Poland, Rumania, Viet Nam, and Yugoslavia. **Does not include shut in, injection, or service wells.

COUNTRY	ESTIMATED PROVED RESERVES 1-1-1984		OIL PRODUCTION			No. of ref.	REFINING Capacity (b/cd) January 1, 1984			
	Oil (1,000 bbl)	Gas (10 ⁹ cu ft)	Producing wells** July 1, 83	Estimated 1983 (1,000 b/d)	% change from 1982		Crude	Thermal operations	Catalytic cracking	Catalytic reforming
AFRICA										
Algeria	9,220,000	110,180	1,090	686.6	-11.5	4	137,400	...	...	23,600
Angola-Cabinda	1,700,000	1,550	254	174.0	+42.6	1	32,100	...	...	1,900
Benin	100,000	...	4	5.2	...	...	...	...	...	...
Cameroon	520,000	4,200	166	114.0	+ 4.6	1	41,135	...	...	6,390
Congo	400,000	2,150	251	95.0	+ 9.2	1	21,000	...	...	2,000
Egypt	3,450,000	7,100	500	690.0	+ 3.3	6	369,330	...	...	10,800
Ethiopia	...	...	...	...	...	1	14,600	...	...	1,898
Gabon	490,000	500	270	150.0	+ 6.4	1	20,000	7,200	...	1,400
Ghana	3,800	4	4	1.2	-20.0	1	28,000	...	...	5,550
Ivory Coast	108,000	3,020	15	24.0	+118.2	2	90,075	...	...	14,600
Kenya	...	...	...	...	...	1	79,000	...	...	8,500
Liberia	...	...	...	...	...	1	15,000	...	...	2,000
Libya	21,270,000	21,350	905	1,020.0	-15.2	2	125,000	...	...	13,982
Madagascar	...	...	...	...	...	1	16,350	...	...	2,600
Morocco	220	...	NA	0.2	0.0	2	74,000	...	...	8,623
Mozambique	...	...	...	...	...	1	17,000	...	...	2,500
Nigeria	16,550,000	34,800	1,296	1,232.0	- 4.4	3	247,000	...	41,400	36,450
Senegal	750,000	...	...	...	...	1	18,000	...	...	1,900
Sierra Leone	...	...	...	...	...	1	10,000	...	...	...
South Africa	115,000	400	...	...	...	4	388,500	66,750	82,500	62,000
Sudan	300,000	...	...	...	...	1	24,000	...	...	2,100
Tanzania	...	200	...	...	...	1	17,000	...	...	4,200
Togo	...	...	...	...	...	1	20,000	...	...	4,400
Tunisia	1,820,000	4,150	91	115.0	0.0	1	34,000	...	...	3,300
Zaire	110,000	40	14	26.0	+18.2	1	17,000	...	...	3,000
Zambia	...	...	...	...	...	1	24,500	...	...	5,600
Total Africa	56,907,020	189,644	4,860	4,548.6	+ 0.1	41	1,879,990	73,950	123,900	229,293
WESTERN HEMISPHERE										
Antigua	...	...	...	...	...	...	...	...	...	...
Argentina	2,428,700	24,420	7,874	481.0	- 0.6	12	678,400	121,600	102,500	37,700
Bahamas	...	...	...	...	...	1	500,000	...	...	...
Barbados	600	...	35	0.5	-16.7	1	3,000	...	...	...
Bolivia	160,500	4,900	260	22.0	-15.4	3	46,930	...	...	14,158
Brazil	1,800,000	2,669	2,115	315.0	+23.0	13	1,301,400	16,200	315,400	21,600
Canada	6,730,000	90,500	36,388	1,396.0	+12.5	28	1,806,600	83,500	437,500	354,550
Chile	748,000	2,400	266	39.0	- 9.3	2	141,000	10,000	35,000	10,000
Colombia	560,000	4,300	2,307	155.0	+ 7.6	4	211,000	61,000	91,000	6,000
Costa Rica	...	...	...	...	...	1	17,000	...	6,500	1,500
Dominican Republic	...	...	...	...	...	2	44,000	...	...	8,300
Ecuador	1,675,000	3,526	523	236.0	+12.9	3	83,582	11,550	11,550	2,513
El Salvador	...	...	...	...	...	1	16,300	...	...	2,800
Guatemala	48,000	33	12	7.5	+17.2	1	16,000	...	...	3,000
Honduras	...	...	...	...	...	1	14,000	...	...	1,800
Jamaica	...	...	...	...	...	1	35,500	...	...	354
Martinique	...	...	...	...	...	1	11,000	...	...	2,500
Mexico	48,000,000	75,352	3,640	2,702.0	- 1.7	9	1,269,000	82,000	297,000	163,800
Netherlands Antilles	...	...	...	...	...	2	740,000	265,000	40,000	15,000
Nicaragua	...	...	...	...	...	1	15,000	...	...	3,000
Panama	...	...	...	...	...	1	100,000	...	...	7,500
Paraguay	...	...	...	...	...	1	7,500	...	...	...
Peru	775,100	1,150	3,329	171.0	-12.8	5	168,550	...	21,950	1,640
Puerto Rico	...	...	...	...	...	2	121,000	...	12,000	5,800
Trinidad & Tobago	630,000	13,100	3,089	158.0	-12.7	2	375,000	...	25,000	27,000
Uruguay	...	...	...	...	...	1	45,000	...	5,000	3,000
Venezuela	24,850,000	54,546	11,604	1,791.0	- 5.3	7	1,224,200	36,400	178,800	6,000
Virgin Islands	...	...	...	...	...	1	600,000	40,000	...	125,000
United States	27,300,000	198,000	636,900	8,669.0	+ 0.2	225	15,930,000	1,498,500	14,473,000	13,240,000
Total Western Hemisphere	115,705,900	474,896	708,342	16,143.0	+ 0.4	332	25,520,962	2,225,750	6,052,200	4,064,515
Total Non-Communist	584,702,600	1,753,150	732,958	38,314.0	- 0.4	659	58,007,045	4,399,163	8,467,380	7,899,405
COMMUNIST AREAS										
China	19,100,000	30,300	NA	2,107.0	+ 3.8	20	2,050,000	NA	NA	NA
U. S. S. R.	63,000,000	1,400,000	101,000	12,388.0	+ 1.1	38	12,000,000	NA	NA	NA
Other††	2,500,000	16,500	NA	450.0	+ 5.9	45	3,150,000	NA	NA	NA
Total Communist	84,600,000	1,446,800	NA	14,945.0	+ 1.6	103	17,200,000	NA	NA	NA
TOTAL WORLD	669,302,600	3,199,950	NA	53,259.0	+ 0.1	762	75,207,045	...	...	...

Worldwide Production

• Offshore

(e) Estimated

(c) Condensate

(NA) Not available

WORLDWIDE PRODUCTION	Name of field, discovery date	Depth, feet	Flow	No. of wells		B'd average first 6 mo. 1983	Cumulative bbl to July 1, 1983	*API gravity	
				Artificial lift	Shut-in				
ABU DHABI	AMERADA GROUP	● Arzanah, 1973	10,750	9	—	9,134	8,924,931	41.0-44.0	
	CFP GROUP	● Abu Al Bukhoosh, 1972	6,400-8,000	3	14	61,603	218,995,550	31.0-33.0	
		● Mubarras, 1969	8,950-10,700	2	18	17,827	71,735,780	38.0	
		● El Bunduq,† 1965	8,300	—	10	—	18,243,841	40.0	
	ADNOC	Asab, 1965	7,500-7,900	34	—	220,252	1,091,594,150	41.0	
		Bab, 1953	7,900-9,900	14	—	15,205	692,400,102	44.0	
		Bu-Hasa, 1962	7,500-8,000	31	—	244,797	2,368,473,099	40.0	
		Sahil, 1967	8,560-9,000	NA	—	—	51,272,400	41.0	
		● Umm Shaif, 1958	8,300	35	—	132,884	1,179,025,060	37.0	
		● Upper Zakum,† 1964	9,150	69	38	8,000	158,900,000	39.0	
● Lower Zakum, 1964		9,100	25	—	74,185	1,100,524,650	39.0		
Total Abu Dhabi			222	—	48	783,887	*6,960,089,563		
ALGERIA ^(e)	SONATRACH	Zarzaitine, 1957	4,700					42.2	
		Edjeleh, 1956	1,500-2,800					37.2	
		Tiguentourine, 1966	2,160-4,265					44.4	
		El Adeb Lareche, 1958	4,100					43.3	
		Assakarfat N. & S., 1958	2,800					42.7	
		Tan Emellel N. & S., 1960	2,800-4,500					42.5	
		Edeyen, 1964	5,580					41.5	
		Hassi Mazoula S., 1963	4,430					40.2	
		Hassi Mazoula B., 1965	4,920					42.0	
		Accheb W. & Kreb, 1963 & 1960	7,360					45.6	
		Tin Fouye N. + F6, 1962	4,265					39.6	
		El Borma, 1967	8,200					42.9	
		Keskassa, 1968	8,860					42.9	
		Mereksen, 1974	9,420					45.8	
		Gara, 1962	9,420					42.9	
		Hassi Messaoud N., 1956	10,500					45.9	
		Hassi Messaoud S., 1956	10,500					46.1	
		Gassi-Touil & Gassi-Touil E., 1961	6,890					50.6-50.8	
		Hassi Chergui	8,200					50.6	
		Nezla N., 1965	8,530					51.5	
		Rhoude El Baguel, 1962	9,850					40.2	
		Mesdar E. & W., 1972	11,155					40.3	
		El Gassi-El Agreb, 1959	10,170	NA	NA	NA	671,000	6,491,245,000	
		Rhoude Nousse & E., 1972	8,530					39.7	
		Tin Fouye Tabankort, 1966	4,600-6,560					41.1-41.3	
		Djoua W., 1967	5,580-6,240					41.1	
		Amassak, 1970	6,565					41.1	
		Tamendjelt, 1970	5,585-6,890					41.1	
		Timedratine, 1964	8,155					42.7	
		Ohanet N. & S., 1960	7,878					43.8	
		Askarene, 1962	8,200					41.7	
		Guellet, 1962	8,960					41.7	
		Stah, 1971	9,515					45.8	
		Ras Toumb, 1976	9,190					35.7	
		Haoud Berkouli-Ben Kahla, 1965	11,000					43.6	
		Guellala-Guellala N.E., 1969	11,320					42.2-42.3	
		N'Goussa, 1974	11,715					42.2	
		Kef El Argoub, 1973	12,570					42.2	
		Oued Noumer, 1969	8,860					48.3	
		Djorf, 1974	9,025					48.3	
		Djebel Onk, 1960	3,940					37.0	
		Alrar FJT	—					—	
		Hassi R'Mel ^(c)	—					—	
		Gassi Touil ^(c)	—					—	
		Other Crude	—					—	
		Condensate	—					—	
		Total Algeria			NA	NA	NA	671,000	6,491,245,000
ANGOLA	FINA ANGOLA	Bento, 1972	7,500	1	—	1	410	4,366,904	26.0
		Ganda, 1975	5,010	1	—	—	920	2,385,095	36.1
		N'Z Kitona S & D, 1973	5,200-5,670	5	—	—	4,151	9,676,215	30.4
		N'Z Pangala, 1973	4,997-5,095	5	3	1	8,430	34,984,364	36.1
		N'Zombo, SW I, SW S. & SE S, 1973	5,245-6,270	3	—	2	2,075	20,361,967	30.2-31.0
		Quenguela, N., 1968	4,900-6,200	1	19	—	3,522	32,516,225	31.1
		Quinfuquena, I & S, 1975	6,800-7,050	12	—	—	4,717	15,987,205	31.4-32.0
		Quingula, 1972	4,100	3	8	1	6,604	20,341,294	36.2

PRODUCTION BY FIELDS

WORLDWIDE PRODUCTION	Name of field, discovery date	Depth, feet	Flow	No. of wells		B/d average first 6 mo. 1983	Cumulative bbl to July 1, 1983	*API gravity
				Artificial	Shut-in			
	Cabeça da Cobra, 1969	3,400	6	...	6	503	2,046,570	41.1
	Pambo, 1982	4,600	1	...	...	1,200	94,543	38.8
	Luango, 1977	3,800	3	...	...	823	793,080	38.0
	Other	3,400-6,500	8	4	19	945	35,204,405	27.5-37.4
GULF CABINDA	Erva, 1969	10,650	1	...	...	500	3,549,000	30.2
	Kambala, 1971	11,100	2	...	...	3,700	6,182,000	32.8
	Kungulo, 1976	3,900	11	6	...	25,500	18,267,000	32.2
	Limba, 1969	2,900-8,750	3	8	3	18,000	51,459,000	31.6
	Livrite, 1979	8,200	1	...	2	100	286,000	31.7
	Malongo, N., 1966	1,500-8,500	7	46	9	16,300	185,652,000	29.6
	Malongo, S., 1966	1,300-1,500	2	25	5	8,000	58,104,000	25.1
	Malongo, W., 1969	1,800-6,900	5	17	20	18,000	201,814,000	22.5
	Takula, 1982	4,000-6,350	22	...	1	26,000	5,033,000	31.5
	TEXACO							
	Cuntala, 1978	7,000-7,500	1	...	...	464	1,783,318	34.0
	Essungu	6,500-6,750	10	...	...	11,784	7,599,976	37.0
	Total Angola		116	138	81	163,151	733,980,016	
ARGENTINA*								
	Chubut, 1907	1,968-9,168	18	1,813	33	87,760	853,474,200	21.1-26.0
	Jujuy, 1969	2,461-16,732	5	...	2	1,170	58,745,358	46.5-47.0
	La Pampa, 1968	3,609-4,921	...	165	4	7,881	60,969,597	31.0-31.1
	Mendoza, 1932	2,178-16,778	39	950	21	116,749	905,044,783	23.7-32.0
	Neuquen, 1918	1,312-12,498	164	653	14	68,564	374,966,523	24.0-41.0
	Rio Negro, 1960	2,953-7,546	60	913	13	48,462	369,140,361	22.5-41.0
	Salta, 1928	6,551-15,092	27	12	7	10,793	100,800,380	39.0-59.0
	Santa Cruz, 1946	1,498-17,060	120	2,763	64	109,812	819,927,022	21.1-30.0
	Tierra del Fuego, 1959	5,249-7,824	100	72	4	20,322	118,531,516	43.4-46.0
	Total Argentina		533	7,341	162	471,513	3,661,599,740	
AUSTRALIA ESSO-BHP								
	Barracouta, 1968	4,550	2	...	...	1,343	19,273,000	62.8
	Cobia, 1972	7,700	1	...	1	9,786	3,120,000	44.6
	Halibut, 1967	7,700	17	...	2	79,044	568,252,000	43.3
	Kingfish, 1967	7,500	13	11	18	98,714	831,449,000	46.9
	Mackerel, 1969	7,700	17	...	1	114,493	185,146,000	45.6
	Tuna, 1968	6,500	24	...	6	14,652	18,094,000	40.5
	Snapper, 1968	4,350	10	...	2	5,677	1,874,000	47.0
	Marlin, 1966	5,100	1	1	2	1,923	1,001,000	50.0
	W. Kingfish, 1968	7,500	6	...	1	12,442	2,331,000	46.9
	Fortescue, 1978	7,700	1	...	...	2,991	546,000	43.0
INTERNATIONAL OIL	Alton, 1964	6,000	...	5	...	55	1,833,800	50.0
	Bennett, 1965	5,330	...	1	...	5	91,483	45.0
	Cabawin, 1961	5,800	1	...	...	16	41,581	49.0
	Moonie, 1961	5,800	...	21	1	634	20,542,201	44.5
WAPET GROUP	Barrow Island, 1964	1,200-6,700	9	349	93	21,985	192,350,000	36.9
HARTOGEN GROUP	Borah Creek, 1982	4,860	...	...	1	...	1,131	38.0
	Kincora, 1980	4,800	5	2	2	288	102,083	35.0
	Sandy Creek, 1982	4,840	...	...	1	...	265	42.0
	Waratah, 1982	5,350	4	...	...	177	15,791	33.0
SANTOS GROUP	Tirrawarra, 1970	9,800	8	...	7	4,040	415,981	52.0
	Total Australia		119	390	138	368,265	1,846,530,316	
AUSTRIA								
MOBIL	Voitsdorf, 1963	7,000	2	22	11	856	20,549,102	36.0
	Sattledt, 1971	5,700	...	13	1	519	4,033,561	37.0
	Kemating, 1979	6,100	...	7	...	1,432	1,856,249	34.0
	Gaiselberg, 1938	5,200	...	31	29	833	30,842,724	24.0
	Other	...	...	66	29	2,114	22,840,461	32.0
OEMV(e)	Hochleiten, 1974	3,100-5,000	7	29	9	1,471	1,533,100	21.3
	Matzen, 1949	6,100	24	676	170	12,747	361,039,898	25.7
	Prawarth, 1947	1,600-6,500	1	58	10	1,216	10,536,647	28.4
	St. Ulrich, 1938	1,600-4,300	2	132	60	903	40,251,175	31.1
	Other	...	8	162	38	1,968	130,868,460	...
	Total Austria		44	1,196	357	24,059	624,351,377	
BAHRAIN(e)								
BANOCO	Awali, 1932	1,850-4,600	158	85	34	42,000	724,237,000	33.0
	Total Bahrain		158	85	34	42,000	724,237,000	
BARBADOS(e) BARB. NOC								
	Woodbourne, 1966	6,500	NA	NA	NA	540	1,863,365	30.5
	Other	...	...	...	...	...	42,439	...
	Total Barbados		NA	NA	NA	540	1,905,804	
BENIN								
SAGA	Seme, 1968	6,232	4	...	...	5,200	548,000	NA
	Total Benin		4	...	...	5,200	548,000	

*Total output by YPF and all contract producers by provinces

PRODUCTION BY FIELDS

WORLDWIDE PRODUCTION	Name of field, discovery date	Depth, feet	Flow	No. of wells		B/d average first 6 mo. 1983	Cumulative bbl to July 1, 1983	°API gravity
				Artificial lift	Shut-in			
BOLIVIA								
YPFB ^(a)	Camiri, 1927	3,936	9	51	...	770	47,388,550	55.0
	Carand, 1960	3,940	7	25	...	1,259	53,205,700	60.0
	Colpa, 1961	9,184	20	5	...	775	17,537,400	65.0
	Monteagudo, 1966	4,592	7	19	...	2,063	28,529,000	41.0
	La Pena, 1965	8,856	18	2	...	1,293	19,211,000	43.0
	Palmar, 1964	10,758	3	1	...	680	1,381,500	65.0
	Rio Grande, 1961	9,512	31	4	...	7,060	54,419,000	62.0
	Espino, 1979	14,655	2	...	...	575	668,000	56.2
OCCIDENTAL ^(c)	Other	...	16	12	...	850	25,340,000	...
	Tita, 1976	6,450	14	1	...	860	3,733,550	70.5
TESORO ^(c)	Porvenir, 1978	9,600	6	...	...	5,300	3,439,100	69.5
	La Vertiente, 1977	10,827	7	...	...	1,750	1,970,000	64.1
Total Bolivia			140	120	...	23,235	256,822,800	...
BRAZIL ^(e)								
PETROBRAS	Furado, 1969	4,440-5,500						35.0
ALAGOAS	Pilar	NA						NA
	Tabuleiro de Martins, 1957	NA						27.0
	Other	...						...
								...
BAHIA	Agua Grande, 1951	820-4,265						40.0
	Aracas, 1965	3,280-8,856						41.0
	Buracica, 1959	1,476-1,840						35.0
	Faz. Imbe, 1964	2,130-5,575						40.0
	Faz. Boa Esperanca, 1966	7,215-8,036						39.0
	Faz. Pamelas, 1962	NA						37.0
	Malombe, 1966	3,280						41.0
	Mata Remanso, 1971	4,445-4,560						35.0
	Miranga, 1965	3,280-3,936						40.0
	Rio Dos Ovos, 1979	NA						35.0
	Santana, 1962	NA						37.0
	Sesmaria	NA						NA
	Candeias, 1941	3,280-7,415						30.0
	Cassarongongo, 1959	1,475-4,755						32.0
	Dom Joao Terra, 1947	NA						38.0
	Gomo, 1961	NA						32.0
	Taquipe, 1958	3,115-3,935						40.0
	• Candeias Mar	NA						30.0
	• Dom Joao Mar, 1947	920						38.0
	• Ilheus, 1979	NA						41.0
	Other	...						...
CEARA	Faz. Belem, 1980	NA						NA
	• Curima, 1978	6,888						32.0
	• Xareu, 1977	5,717-5,766	NA	NA	NA	312,000	1,388,190,000	39.0
ESPIRITO SANTO	Faz. Cedro, 1962	5,248						28.0
	Sao Mateus, 1969	NA						27.0
	Lagoa Parda, 1977	5,576						30.0
	Rio Itaunas, 1977	NA						28.0
	• Cacao, 1978	9,184						37.0
RIO DE JANEIRO	Other	...						...
	• Enchova, 1976	5,973-7,885						23.0
	• Bonito, 1977	NA						27.0
	• Garoupa, 1974	11,382						30.0
	• Namorado, 1975	10,083						28.0
	• Norte Garoupa, 1974	12,693						30.0
	• Pampo, 1977	6,215						27.0
	• S.A.G.	NA						NA
	• Linguado, 1981	NA						NA
	• Badojo, 1981	NA						NA
• Biculo, 1982	NA						NA	
RIO GRANDE DO NORTE	Alto do Rodrigues	NA						...
	• Ubarana, 1973	7,216-8,365						40.0
	• Agulha, 1975	5,412						33.0
	Other	...						...
SERGIPE	Atalaia Sul	NA						NA
	Carmopolis, 1963	2,460						24.0
	Riachuelo, 1961	1,475						28.0
	Siririzinho, 1967	1,640						30.0
	• Carioba, 1969	6,232-6,890						36.0
	• Camurim, 1970	6,232						25.0
	• Dourado, 1970	3,620-3,635						36.0
	• Guancema, 1968	3,335-4,430						41.0
	Other	...						...
								...
Total Brazil			NA	NA	NA	312,000	1,388,190,000	...
BRUNEI								
BRUNEI SHELL	• Ampa SW, 1963	7,068-8,155	126	71	...	36,201	481,475,123	41.0
	• Champion, 1970	4,300	126	36	...	53,540	208,991,000	23.0
	• Fairley, 1969	10,740	38	5	...	11,376	88,708,087	40.0
	• Fairley-Baram, 1973	9,500	...	5	...	1,151	12,361,594	40.0

PRODUCTION BY FIELDS

WORLDWIDE PRODUCTION	Name of field, discovery date	Depth, feet	No. of wells			B'd average first 6 mo. 1983	Cumulative bbl to July 1, 1983	*API gravity
			Flow	Artificial lift	Shut-in			
	• Magpie, 1975	NA	1	14	...	19,329	34,362,618	31.0
	Seria, 1928	NA	345	193	...	30,112	931,301,365	34.0
	Other	...	...	7	...	359	703,097	...
	Total Brunei	...	649	317	...	152,068	1,757,902,884	...
BURMA (c)	MYANMA							
	Chauk-Lanywa, 1902	1,500- 4,000	...	...	...	...	...	36.0
	Mann, 1970	1,600- 7,000	...	...	...	...	...	37.5
	Myanaung, 1964	2,000- 4,000	170	275	...	30,000	444,380,000	40.5
	Prome, 1965	850- 5,000	...	...	...	...	...	36.0
	Yenangyaung, 1902	100- 6,700	...	...	...	...	...	36.0
	Total Burma	...	170	275	...	30,000	444,380,000	...
CAMEROON	ELF (e)							
	• Betika, 1972	5,300	6	2	...	7,700	11,454,000	42.5
	Ekoundou S., 1975	6,200	14	3	...	9,800	15,504,000	24.0
	Kole, 1974	5,500	10	4	...	8,800	21,993,000	31.0
	Kombo Center, 1976	5,900	21	7	...	26,000	38,176,000	37.0
	Kombo North, 1978	7,200	3	...	...	4,600	4,353,000	35.0
	Ekoundou Horst plus Center, 1972	7,200	26	3	...	27,800	20,532,000	29.0
	Boa, 1976	5,900	7	...	...	2,400	1,324,000	35.0
	Bavo South, 1976	5,600	18	2	...	6,300	2,830,000	29.3
	Betika S. Marine, 1979	6,300	3	1	...	2,000	2,212,000	30.0
	Ekoundou N. Marine, 1977	5,250	13	4	...	11,000	10,300,000	36.0
	Mokoko NE plus Abana, 1977	4,600	10	2	...	*1,260	...	29.0
	Asoma Center, 1977	4,600	...	...	...	*940	...	19.0
	Asoma Marine, 1973	3,600	7	...	...	*780	...	19.0
	Kita E. Marine, 1978	6,900	...	...	...	*940	...	40.8
	Mokoko S. Marine, 1977	3,300	...	...	...	*630	...	17.0
	Inova Marine, 1976	6,200	...	...	...	*1,250	...	32.8
	Total Cameroon	...	138	28	4	106,400	128,678,000	...
CANADA	ALBERTA							
	Acheson, 1950	3,390	117	...	...	10,200	100,500,000	38.0
	Banff, 1940	2,574- 3,300	164	...	...	3,900	33,400,000	...
	Bellshill Lake, 1955	2,950	250	...	...	5,900	38,200,000	...
	Bonnie Glen, 1952	3,959- 6,779	156	...	...	56,100	417,400,000	34.0-44.0
	Carson Creek, N., 1958	8,787- 8,935	76	...	...	19,100	115,400,000	44.0
	Cessford, 1950	2,800- 3,028	249	...	...	3,300	26,200,000	...
	Clive, 1951	6,074- 6,208	132	...	...	5,800	45,100,000	...
	Countess, 1951	2,858- 4,272	115	...	...	8,100	38,000,000	...
	Fenn-Big Valley, 1950	3,900- 5,400	312	...	...	31,800	255,100,000	32.0
	Gilby, 1962	4,201- 7,000	126	...	...	3,100	45,100,000	...
	Golden Spike, 1949	3,570- 5,961	77	...	...	3,100	224,400,000	36.0
	Harmattan, E.	8,040- 8,558	114	...	...	5,100	63,500,000	...
	Harmattan-Elkton, 1955	8,796-10,757	66	...	...	4,100	54,900,000	...
	Inniskill, 1956	6,730- 8,440	80	...	...	4,700	69,200,000	...
	Joarcam, 1949	3,179	225	...	...	5,000	91,100,000	...
	Joffre, 1953	4,983- 6,779	146	...	...	3,000	75,900,000	...
	Judy Creek, 1951	8,307- 8,701	267	...	...	22,500	356,700,000	43.0
	Kaybob, 1957	4,870- 9,577	85	...	...	9,400	89,000,000	...
	Kaybob, S., 1958	5,600-10,042	101	...	...	9,900	72,400,000	...
	Leduc-Woodbend, 1947	3,062- 5,380	737	...	...	7,300	365,900,000	40.0
	Lloydminster, 1933	1,690- 1,945	734	...	...	5,900	41,600,000	...
	Medicine River, 1954	5,435- 7,600	262	...	...	8,500	57,400,000	...
	Mitsue, 1964	5,908	272	...	...	30,700	228,400,000	43.0
	Nipisi, 1965	5,648- 5,726	247	...	...	31,900	205,900,000	41.0
	Pembina, 1953	3,000- 6,133	3,576	...	...	73,400	1,055,300,000	32.0-37.0
	Provost, 1946	2,760- 2,898	786	...	...	7,100	51,700,000	...
	Rainbow, 1965	4,994- 6,160	186	...	...	55,800	411,400,000	38.0-42.0
	Rainbow, S., 1965	6,102- 6,400	41	...	...	5,800	60,300,000	...
	Red Earth, 1956	4,184- 4,878	168	...	...	4,300	33,300,000	...
	Redwater, 1948	2,012- 3,200	857	...	...	29,200	752,400,000	35.0
	Simonet, 1958	10,500	27	...	...	2,000	35,900,000	...
	Snipe Lake, 1962	8,500	94	...	...	3,400	50,200,000	...
	Sturgeon Lake, S., 1953	4,912- 8,471	141	...	...	11,600	114,300,000	37.0
	Sundre, 1954	8,700- 9,000	55	...	...	2,700	34,100,000	...
	Swan Hills, 1957	8,100	742	...	...	52,900	593,400,000	40.0
	Swan Hills, S., 1959	8,400	199	...	...	26,800	303,400,000	...
	Turner Valley, 1913	3,100- 9,150	162	...	...	3,100	134,300,000	39.0
	Utkuma Lake, 1963	5,624	108	...	...	8,200	37,800,000	...
	Virginia Hills, 1957	9,210	150	...	...	11,400	119,500,000	34.0
	Wainwright, 1925	1,903- 2,200	532	...	...	6,900	56,900,000	...
	Westerose, 1952	6,818	19	...	...	11,800	96,400,000	...
	Willesden Green, 1956	5,157	671	...	...	10,500	96,800,000	...
	Wizard Lake, 1951	4,044- 5,973	42	...	...	34,900	273,500,000	...
	Zama	3,702	196	...	...	5,900	69,800,000	33.0-37.0
	Other	...	8,268	...	...	385,585	1,286,998,000	...

*Initial flow during test.
Not included in column total.

PRODUCTION BY FIELDS

		Name of field, discovery date	Depth, feet	No. of wells capable of prod.		B/d average, first 6 mo. 1983	Cumulative bbl. to July 1, 1983	*API gravity		
BRITISH COLUMBIA		Boundary Lake, 1957	3,418-4,575	351		12,400	150,600,000	40.0		
		Other		378		23,500	217,200,000			
MANITOBA		All fields		1,042		12,000	138,600,000			
SASKATCHEWAN		Steelman, 1950	4,600	675		11,200	236,000,000	27.0		
		Weyburn, 1955	4,600	584		11,700	258,000,000	28.0		
		Other		11,159		132,100	1,363,900,000			
ONTARIO		All fields				1,500	58,100,000			
NEW BRUNSWICK		All fields					800,000			
NORTHWEST TERRITORIES		All fields		69		3,000	26,000,000			
Total Canada				36,388		1,259,085	11,227,598,000			
WORLDWIDE PRODUCTION		Name of field, discovery date	Depth, feet	No. of wells Artificial lift		B/d average, first 6 mo. 1983	Cumulative bbl. to July 1, 1983	*API gravity		
CHILE		ENAP-MAINLAND	Canada, 1962	6,090				38.4		
			Daniel, 1960	5,806				25.4		
			Daniel Este, 1961	5,523	96	8	238	6.174		
			Dungenes, 1962	5,251				25.0		
			Posesion, 1960	5,622				28.6		
		TIERRA DEL FUEGO	Calafate, 1955	6,045				63.6		
			Catalina Sur, 1961	5,779	55	21	211	3.975		
			Cullen, 1954	5,730				49.3		
			Tres Lagos, 1957	5,724				44.0		
		STRAIT OF MAGELLAN	Ostion, 1977	7,156				41.8		
			Posesion, 1977	6,727	34	52	18	29.510		
			Spitful, 1977	6,298				37,185,300		
			Spitful Norte, 1978	7,150				33.0		
Total Chile				185	81	467	39,659	221,739,500	34.5	
CHINA, TAIWAN		CHINESE PETROLEUM	Tiechengshan, 1959	31		3	1,551	12,992,885	51.0	
			Chingtsou, 1967	8		5	156		50.0	
			Yunghoshan, 1971	5		1	244	5,168,583	45.0	
			Other	42		12	331		50.0	
Total China, Taiwan				86		21	2,828	18,161,468		
COLOMBIA		ECOPETROL	Galan, 1945	3,200		66	18	1,615	19,435,000	19.0
			Intantas, 1918	3,200		290	198	2,339	220,092,000	25.8
			La Cira, 1925	3,200		617	159	10,217	480,009,000	24.0
			Lisama, 1957	9,500	27	59	6	7,800	23,328,000	31.0
			Llanito, 1960	7,300		35	10	3,600	14,759,000	21.0
			Peroles-Tesoro, 1977	4,400-8,000	2	9	1	750	750,000	36.4
			Boquete, 1961	8,000		12	9	922	16,284,000	43.0
			Tibu, 1940	4,200		160	58	4,806	218,722,000	37.2
			Catnagallo, 1941	6,800	1	12	1	717	17,209,000	19.7
			Casabe, 1941	3,800		259	54	4,772	214,064,000	20.7
			Yanguai, 1954	8,700	2	53	5	9,044	98,041,000	19.5
			Churuyaco, 1968	8,900	2			1,250	2,061,000	31.8
			Orto, 1963	6,600		51	37	13,250	17,135,000	39.7
			Puerto Colon, 1965	9,600		4	1	1,056	8,902,000	30.5
			Apia, 1981	10,500	2			3,340	904,000	24.0
			Pavoa, 1962	8,000	17	33	5	2,400	66,928,000	27.9
			Salinas, 1936	2,500		56	6	3,961	6,267,000	28.0
			Andalucia Sur, 1980	1,700		14		1,711	1,766,000	33.0
			Arauca, 1980	18,000	4			1,890	387,000	41.0
			Cocoma Association	2,100		35	5	2,872	1,071,000	12.5
			Other		17	126	100	4,992	172,947,000	
		CHEVRON	Castilla, 1969	6,500		8		3,525	4,997,000	13.5
			Rio Zulia, 1961	5,700		17	3	3,060	124,284,000	41.0
		TEXACO	Velasquez, 1946	7,500		113	27	5,092	157,111,117	19.0-24.0
			Palagua, 1954	5,000		112	26	4,608	77,217,873	14.0-17.0
			Cocoma, 1963	2,100		42	6	3,253	8,040,246	12.0-13.0
			Tisquirama, 1963	8,000		8	1	534	4,697,532	16.0-28.0
			Teca, 1981	2,100		35	4	2,854	1,070,962	12.0-13.0
			Other			7	5	366	11,453,944	
		INTERCOL	Bonanza, 1963	4,000	NA	NA	NA	811	11,220,000	30.0
			Provincia, 1962	8,000	NA	NA	NA	8,883	134,428,000	33.0
		TENNECO	Dina, 1962	2,900	NA	NA	NA	22,250	38,386,000	22.5
			Tello, 1972	4,200	NA	NA	NA	11,350	20,725,000	21.5
Total Colombia				74	2,233	745	149,890	2,194,692,694		
CONGO		AGIP	Loango, 1972	3,000		36		18,900	46,630,000	27.5
		ELF CONGO	Emeraude, 1969	1,000		91		23,500	124,500,000	23.3
			Poinde Indienne, 1957	5,000	3			160	6,700,000	36.9
			Likouala, 1972	4,000	28			19,500	21,200,000	33.2

PRODUCTION BY FIELDS

WORLDWIDE PRODUCTION	Name of field, discovery date	Depth, feet	Flow	No. of wells		B'd average first 6 mo. 1983	Cumulative bbl to July 1, 1983	*API gravity
				Artificial lift	Shut-in			
	• Yanga, 1979	4,000	...	52	...	30,200	15,600,000	27.5
	• Mengo, 1979	6,500	...	3	...	240	230,000	33.4
	• Sendji, 1973	4,000	...	36	...	2,500	250,000	27.5
	• Kundji, 1980	4,000	...	2	...	250	150,000	33.0
	Total Congo		33	218	...	95,250	215,260,000	
DENMARK	DUC • Dan, 1971	6,000-6,400	10	...	8	4,948	21,916,004	30.4
	• Gorm, 1971	6,500-7,000	16	...	...	33,068	19,646,275	34.0
	• Skjold, 1977	5,000	1	...	...	5,336	1,100,522	29.2
	Total Denmark		27	...	8	43,352	42,662,801	
DIVIDED ZONE	AOC • Khafji, 1961	4,400-10,300	109	...	14	212,000	1,971,000,000	28.2
	• Hout, 1969	5,300-10,500	46	...	23	4,000	227,000,000	33.0
	GETTY & KOC Wafra, 1953	1,100-7,000	3	271	141	95,857	1,190,659,470	18.9-23.5
	S. Fuwairis, 1963	6,300	...	6	3	2,160	19,429,632	25.0
	S. Umm Gudair, 1966	8,900	...	15	3	14,321	261,612,489	24.3
	Total Divided Zone		158	292	184	328,338	3,669,701,591	
DUBAI (e)	DUPETCO • Fateh, 1966	7,900-9,000	NA	NA	NA	323,000	1,353,689,000	31.8
	• S.W. Fateh, 1970	7,500-9,000	...	...	...	...	...	30.3
	• Falah, 1972	8,100	...	...	...	...	...	25.5
	• Rashid, 1973	9,400-11,500	...	...	...	...	...	38.0
	Total Dubai		102	39	15	323,000	1,353,689,000	
ECUADOR	CEPE Ancon, 1921	4,000	19	275	216	781	115,163,626	35.6
	Shuara, 1980	9,100	5	...	...	5,836	1,592,557	29.6
	Secova, 1980	9,100	6	...	...	7,268	1,820,300	30.3
	Shushuqui, 1980	9,200	4	...	...	6,215	1,632,835	28.8
	Charapa, 1967	10,000	NA	NA	NA	...	...	NA
	Pichincha, 1983	9,000	NA	NA	NA	...	...	NA
	Other		...	...	...	...	4,837,000	...
	TEXACO Aguacico, 1968	9,850	4	3	3	9,041	31,087,376	22.0
	Atacapi, 1968	9,850	3	...	2	4,363	6,993,552	31.0
	Auca, 1970 Auca Sur	10,300	3	16	7	16,886	39,622,744	28.0
	Lago Agrio, 1967	10,250	9	14	7	11,187	92,525,237	28.5
	Parahuacu, 1968	9,850	3	1	1	2,238	4,006,572	30.0
	Sacha, 1969	10,000	32	52	15	60,522	245,779,086	28.0
	Shushufindi, 1959	9,700	...	42	15	92,593	338,816,040	30.0
	Yuca, 1970 Yuca Sur	10,090	1	5	2	4,781	4,663,634	28.0
	Culebra, 1973	10,613	...	1	...	833	478,985	19.5
	Yulebra, 1980	10,345	...	1	...	743	486,513	19.0
	CITY ECUATORIANA Mariann, 1971	7,700	5	4	...	900	1,923,226	23.0
	Fanny, 1972	7,700	8	3	...	2,500	4,504,491	23.0
	Tarapoa, 1973	8,300	2	2	...	700	452,124	23.0
	Joan, 1974	7,500	...	...	2	...	5,479	18.0
	Total Ecuador		104	419	270	227,387	896,391	
EGYPT	AMOCO Abu Gharadig, 1972	9,500	13	...	...	9,700	32,300,000	36.0
	• El Morgan, 1965	5,100-6,400	1	56	9	150,600	773,600,000	27.0-32.0
	• GS-382, 1977	10,500	4	...	1	11,200	24,600,000	33.9
	• July, 1973	8,100-10,000	2	17	1	83,100	325,600,000	31.0-34.6
	• Ramadan, 1974	11,300	4	11	...	77,400	259,900,000	31.7
	• Razzak, 1972	7,700	5	...	...	2,300	37,900,000	36.0
	• SG-300, 1976	5,876	...	2	...	5,700	10,900,000	24.8
	• Shoab Ali, 1978	6,000	1	9	...	31,400	45,000,000	34.0
	• October, 1978	11,000	15	...	...	123,800	109,300,000	28.0
	• WD 33, 1972	9,800-10,800	1	...	...	500	2,000,000	32.0
	• SB 305, 1981	8,100	...	1	...	2,000	1,000,000	30.0
	• GS 315, 1981	6,400	3	...	...	1,500	300,000	29.6
	• GS 347, 1981	4,300	...	1	1	6,100	1,100,000	32.0
	• GH 376, 1981	8,600	1	...	1	500	100,000	25.0
	• Block 350, 1981	5,200	5	...	...	1,700	6,800,000	36.0
	AGIP(e) Belayim, 1953	7,000-8,500	4	82	7	33,630	349,754,000	22.0
	Belayim Marine, 1961	8,500	2	28	1	85,600	360,584,000	30.5
	PHILLIPS GROUP El Alamein, 1966	8,700	6	8	2	2,936	62,283,694	33.6
	Umbarka, 1976	10,700	2	...	3	1,111	3,141,999	43.9
	Yidma, 1971	9,000	3	...	1	2,244	18,914,304	44.0
	EGPC(e) Amer, 1965	3,500	1	12	12	1,830	10,292,800	21.5
	Asi, 1947	3,000	3	...	...	930	38,285,046	21.6
	El-Yusri, 1968	3,400-3,900	3	21	15	3,800	28,785,482	21.0
	Bakr, 1958	3,200	1	46	35	3,157	67,349,600	19.0
	Gharib, 1938	2,200-4,500	...	80	158	7,300	240,302,000	25.5
	Sudr, 1946	2,600	2	13	...	1,200	43,155,139	21.6
	Kareem	2,215-2,310	...	9	26	600	10,535,600	16.6
	Shukheir	2,400-2,500	5	...	4	650	2,184,000	34.0
	Other	...	2	9	8	1,017	8,510,700	...
	CFP Ras Shukheir, 1980	6,200-6,300	1	...	2	950	1,000,000	40.0

*Includes some Khafji Ratawi zone crude (30-32°) mixed in with Hout field crude.

*Started production August 1982. *Started production December 1983. †Started production July 1983.

PRODUCTION BY FIELDS

WORLDWIDE PRODUCTION	Name of field, discovery date	Depth, feet	No. of wells			B/d average first 6 mo. 1983	Cumulative bbl to July 1, 1983	API gravity	
			Flow	Artificial lift	Shut-in				
BADR PETROLEUM (SHELL)	SUCO • Ras Budran, 1978	11,400	4	...	2	12,500	2,250,000	26.0	
	• LL 87-2	11,000	1	...	...	650	120,000	35.0	
	Badr el Din, 1982	NA	NA	NA	NA	156	28,289	38.0	
	Total Egypt		95	405	289	668,761	2,877,876,653		
FRANCE	ALSACE	All fields	...	...	5	5	90	2,129,020	...
	Abandoned	...	...	...	...	...	24,267,248	...	
	AQUITAINE BASIN	Lacq Superieur, 1949	2,170	12	32	9	846	23,896,169	22.3
	Parentis, 1954	7,710	3	49	6	8,325	184,990,561	33.4	
	Lugos, 1956	5,250	1	22	2	1,564	8,384,614	20.8	
	Cazaux, 1959	7,550	3	36	2	5,605	59,573,640	34.2-37.0	
	Lavergne, 1962	11,480	...	4	...	539	11,484,364	41.7	
	Montastruc, 1973	5,200	...	5	2	452	4,645,014	32.3	
	Pecorade, 1974	10,660	7	...	5	2,155	4,831,940	29.3	
	Castera-Lou, 1976	9,600	...	7	...	767	1,157,687	21.7	
	Vic Bilh, 1979	7,100	6	2	12	4,618	4,189,083	26.6	
	Other	...	...	16	4	556	13,345,291	...	
	Abandoned	...	...	...	...	...	70,857	...	
	PARIS BASIN	Coulommies, 1958	6,230	...	27	18	405	12,494,053	32.6
	Châteaurenard, 1958	1,800	...	27	10	516	4,702,668	27.5	
	Saint-Martin, 1959	4,590	1	11	2	395	7,764,835	33.0	
	Saint-Firmin, 1960	1,800	...	36	16	920	8,637,906	27.5	
	Chuelles, 1961	1,800	...	34	20	390	5,556,913	27.5	
	Courtenay, 1964	2,000	...	27	7	542	1,725,706	27.5	
	Soudron, 1976	4,600	1	21	4	807	945,060	34.4	
	Donnemarie, 1979	8,040	...	4	...	819	457,598	36.2	
	Other	...	...	3	68	27	1,216	19,185,035	...
	Abandoned	...	...	...	...	...	162,761	...	
	SOUTHEAST + JURA	All fields abandoned	...	...	...	...	...	223,043	...
	Total France			37	433	151	31,527	404,821,066	
	GABON	ELF • Anguille, 1962	9,200	26	5	6	19,150	103,866,000	31.2
		• Anguille NE, 1968	7,500	7	3	1	3,500	41,583,000	32.0
		• Anguille NNE, 1971	7,500	2	...	...	950	7,112,000	32.0
		• Barbier, 1972	6,000	17	...	4	13,200	70,129,000	29.5
		• Brene, 1976	5,000	6	...	3	12,200	41,348,000	36.5
		• Clairette, 1956	4,400	11	...	28	760	28,338,000	29.0
		• Girelle, 1973	9,400	4	...	1	5,300	21,665,000	32.0
		• Gonelle, 1972	5,800	10	...	1	5,000	15,805,000	24.2
		• Grondin, 1971	7,500	19	...	8	12,760	155,910,000	16.4
		• Mandaros, 1972	4,900	16	...	14	300	59,188,000	19.8
		• Olende, 1976	6,700	5	...	1	2,300	3,516,000	33.8
		• P.G.S. Marine, 1975	7,500	7	...	1	680	4,323,000	32.5
		• Port Gentil Ocean, 1964	6,500	5	...	4	1,500	18,772,000	33.0
		• Tchengué, 1957	4,100	6	...	18	1,540	27,679,000	26.8
		• Torpille, 1968	8,200	14	...	5	8,500	62,739,000	35.8
		• Baliste, 1974	4,900	6	...	2	2,780	3,003,000	28.1
		• M'Bya Sud, 1969	6,700	17	...	2	7,200	5,403,000	35.4
• Anguille SE, 1962		8,200	4	...	...	1,840	2,233,000	32.8	
• Ayol Marine, 1979		7,700	8	...	...	3,400	1,965,000	22.8	
• Baudroie N., 1980		7,500	4	...	...	6,370	3,503,000	34.5	
• Baudroie Marine, 1968		7,500	...	...	1	1,900	344,000	33.3	
Other		...	...	20	...	32	2,260	47,390,000	...
SHELL GULF ELF • Lucina-Marine, 1971		5,900	11	...	1	7,531	28,479,412	37.0	
SHELL ELF		Gamba, 1963	3,000	31	...	5	7,595	143,407,152	32.4
Ivinga, 1967		3,100	22	...	5	7,851	87,508,588	32.5	
Total Gabon				278	...	127	150,067	985,209,152	
GHANA		AGRI-PETCO • Saltpond, 1977	8,500	4	...	2	1,200	2,749,000	39.4
		Total Ghana		4	...	2	1,200	2,749,000	
GREECE		N. AEGEAN PET. CO. • Prinos, 1974	8,000-8,800	14	...	...	24,600	13,384,000	30.6
		Total Greece		14	...	...	24,600	13,384,000	
GUATEMALA(e)		ELF	Rubelsanto, 1974	5,300-7,000	...	...	...	...	26.0-30.0
		West Chinaja, 1977	3,200-3,800	NA	NA	NA	7,000	6,623,000	35.0-43.0
		Caribe, 1981	NA	...	...	...	...	...	22.0-24.0
		Total Guatemala		NA	NA	NA	7,000	6,623,000	
INDIA(e)		GUJARAT STATE	Ankleshwar, 1960	2,953-3,937	...	...	...	...	...
		Bakrol, 1968	4,593-4,921	...	...	...	...	...	...
		Kadi, N., 1968	2,953-3,909	...	...	...	...	...	...
		Total India		...	...	...	...	...	...

PRODUCTION BY FIELDS

WORLDWIDE PRODUCTION	Name of field, discovery date	Depth, feet	No. of wells			B'd average first 6 mo. 1983	Cumulative bbl to July 1, 1983	API gravity
			Flow	Artificial lift	Shut-in			
ASSAM STATE	Kadi, S., 1968	5,906-6,562						
	Kaloi, 1961	4,265-5,250						
	Kathana, 1965	5,250-5,906						
	Kholka, 1966	4,265-5,577						
	Kosamba, 1963	1,968-2,625	NA	NA	NA	385,000	1,336,447,000	14.0-44.0
	Nawagam, 1963	4,429-6,652						
	Sanand, 1963	4,265-4,593						
	Sobhasen, 1968	4,429-5,906						
	Wovel, 1963	4,265-4,593						
	Digboi, 1890	300-7,500						
	Geleki, 1968	12,632-12,795						
	Lakwa, 1965	8,038-12,795						
	Moran, 1958	11,000						
	Nahorkatiya, 1953	9,500						
	Rudrasagar, 1961	10,171-10,500						
MAHARASHTRA STATE	Bombay High, 1974	4,530-4,630						
Total India			NA	NA	NA	385,000	1,336,447,000	

INDONESIA	PERTAMINA UEP I	Besitang, 1977	3,973	8	3		660	1,449,349	51.5	
		Gebang, 1977	2,917	2	19		728	4,662,775	54.0	
		K. Simpang, 1971	3,740-5,019	26	7	11	7,533	8,663,602	45.0	
	P. Tabuhan, 1937	3,350-5,893	24	5	3	2,009	23,012,917	50.8		
	Rantau, 1929	2,764	1	113	13	4,964	223,819,400	45.3		
	Serang Jaya, 1926	3,701	6		4	496	2,611,343	47.5		
	Other		6	1	1	300	14,137,264			
	PERTAMINA UEP II	Benuang, 1942	6,103	2		10	2,150	2,768,908	35.1	
		Benakat East, 1973	NA	6	30	9	2,703	113,928,233	NA	
		Tempino, 1931	1,647	1	48	113	1,247	83,869,953	23.0	
		Gn. Kemala, 1938	5,448	10	1	38	890	24,170,608	38.0	
		Limau, 1928	3,896-4,626	11	67	112	2,362	207,492,417	NA	
		Ogan Timur, 1943	3,793	2	4	4	1,510	2,313,631	27.42	
		Talang Jimar, 1937	4,123	1	47	151	3,390	166,718,899	31.0	
		T. Miring, 1935	640	15	4	5	3,008	6,942,294	NA	
		Tanjung Tiga, 1938	3,750	3	39	53	2,365	54,384,536	28.0	
		Kenali Asam, 1931	2,077	1	49	179	1,260	91,051,298	29.0	
	PERTAMINA UEP III	Belimbing	5,371	2	4	14	939	19,010,484		
		Kuang, 1940	5,249	1	6	6	20,463	525,698,787	25.1	
		Other		15	43	313	1,482	55,214,537		
		Cemara, 1976	3,964-7,104	4	2	21	1,670	4,204,429		
		Jatibarang, 1969	3,063	18	52	53	14,739	74,142,272	29.0	
		Tugu Barat, 1979	3,014	7		10	935	904,182		
		Other		4	1	12	349	1,153,251		
		PERTAMINA UEP IV	Bunyu, 1923	2,077	6	36	56	3,449	75,725,593	33.2
			Sangatta, 1939	1,842	18	22	66	4,559	14,426,865	33.0
			Tanjung, 1938	2,296	1	59	27	3,022	98,490,740	39.9
	Tapian Timur, 1967		4,396	7		8	2,451	2,780,561	38.8	
	Warukin S., 1966		2,067		10	11	543	9,391,941	26.9	
	Other				2	5	77	58,400		
PERTAMINA UEP V	Klamono, 1936	574		34	2	990	32,794,524	19.0		
	Linda, 1977	3,281		3	4	96		19.0		
	Sele, 1951	2,156		10	2	798	978,934	35.0		
CALTEX	Aman, 1974	4,700		10		2,458	31,169,704	36.1		
	Antara, 1978	1,425		5		1,496	1,451,921	35.8		
	Balam SE., 1972	4,500		13		566	83,843,497	23.2-30.6		
	Balam S., 1969	1,600		47	1	10,729				
	Bangko, 1970	1,950		60	9	26,276	288,040,235	34.1		
	Batang, 1975	690		11	1	987	402,943	20.8		
	Bekasap, 1955	2,950		47	3	15,780	396,965,976	33.5-34.1		
	Bekasap S., 1968	3,900		10	1	959				
	Benar, 1973	2,450		25		6,628	46,684,312	33.2		
	Intan, 1977	3,350		6		1,934	3,967,588	32.8		
	Jorang, 1972	5,500		11		9,591	11,727,516	37.9		
	Kerang, 1977	3,900		7		1,651	2,910,803	36.7		
	Kopar, 1974	5,300		14		2,254	8,009,057	37.5		
	Kotabatak, 1952	5,500		63	11	20,345	94,969,704	28.7		
	Libo, 1968	6,000	6	1	2	1,277	55,386,135	34.6-42.2		
	Libo SE, 1973	5,900	16	4	6	10,563				
	Lincak, 1981	2,570		2	1	1,439	626,021	33.0		
	Menggala N., 1968	3,850		14	3	4,661	80,115,655	32.5-33.5		
	Menggala S., 1968	3,765		8		3,250				
	Minas, 1944	2,600		374	50	275,879	2,841,778,171	35.0		
	Pager, 1974	4,300		23	2	9,556	56,243,900	36.8		
	Pelita, 1977	6,600		4	1	1,815	1,787,688	37.5		
	Pematang, 1959	3,750	2	37	4	7,722	208,063,016	31.7-35.0		
	Pematang Bow, 1969	5,300		6	1	518				
	Pemburu, 1981	2,300		3		1,450	1,012,749	35.2		
	Petani, 1964	4,750	1	29	1	9,271	248,556,567	32.8		
	Petapahan, 1971	4,500		22	4	6,837	79,504,037	28.1		
	Pinang, 1971	3,950		18		2,811	18,705,485	30.3		
	Pudu, 1972	5,950		12		1,163	24,745,162	35.7		
	Puncak, 1979	2,400		10	1	7,231	3,407,584	32.7		

PRODUCTION BY FIELDS

WORLDWIDE PRODUCTION	Name of field, discovery date	Depth, feet	Flow	No. of wells		D'd average first 6 mo. 1983	Cumulative oil to July 1, 1983	*API gravity
				Artificial lift	Shut-in			
CAL ASIATIC TOPCO	Pungut, 1951	3,400	—	25	—	3,905	36,581,964	37.7
	Seruni, 1972	3,000	—	22	1	4,393	33,732,108	34.8
	Sikladi, 1975	4,340	—	15	1	2,612	13,665,258	39.0
	Sintong, 1971	3,400	—	19	—	3,068	49,027,303	32.0
	Tandun, 1969	3,000	—	9	—	1,305	10,788,268	33.7
	Telinga, 1975	4,205	—	5	1	571	1,710,121	35.3
	Topaz, 1977	5,200	—	1	—	4,291	11,668,668	32.7
	Ubi, 1976	4,350	—	16	1	5,405	7,974,970	34.7
	Waduk, 1975	6,100	—	10	1	5,144	NA	37.7
	Duri, 1941	770	—	618	140	23,311	347,635,647	21.2
	Kulin, 1970	2,050	—	49	—	5,054	21,307,765	20.4
	Other	—	3	50	5	3,455	12,896,609	—
	Lindai, 1971	1,100	—	10	2	1,376	4,170,076	30.9
	Beruk, 1974	1,750	—	12	—	14,838	22,128,260	38.0
	Beruk NE, 1976	1,800	—	3	1	635	1,107,530	39.8
STANVAC (Central Sumatra)	Bungsu, 1976	2,050	—	7	—	7,947	4,973,998	38.2
	Kasikan, 1972	660	—	18	2	1,688	4,006,943	27.7
	Pedada, 1973	950	—	15	1	14,957	43,648,605	31.3
	Sabak, 1974	2,350	—	11	1	5,234	13,500,003	35.7
	Zamrud, 1975	3,630	—	23	—	26,458	11,760,714	40.2
	Langgak, 1976	1,380	—	12	1	889	2,045,964	31.9
	Sago, 1940	1,800	—	69	NA	2,816	116,884,000	34.0
	Lirik, 1939	1,600	—	36	NA	1,703	34,920,000	34.0
	Molek, 1956	2,600	—	28	NA	1,248	10,785,000	34.0
	N. Pulau, 1941	1,800	—	22	NA	1,203	35,554,000	34.0
	S. Pulau, 1941	1,800	—	15	NA	627	4,106,000	34.0
	Binio, 1972	1,600	—	23	NA	1,154	10,504,000	34.0
	Pekan, 1976	3,700	—	33	NA	1,943	5,566,000	35.0
	Merbau, 1979	2,700	1	22	NA	1,949	3,699,000	36.0
	Kerumutan, 1980	3,000	—	19	NA	2,185	2,093,000	35.0
STANVAC (South Sumatra)	N. Merbau, 1980	2,600	—	10	NA	1,190	1,425,000	36.0
	Panduk, 1981	2,500	—	7	NA	967	730,000	46.0
	Kayura, 1982	3,700	—	9	NA	1,287	621,000	35.0
	Other	—	—	9	NA	317	10,889,000	—
	Talang Akar, 1922	2,800	—	42	NA	771	359,973,000	35.0
	Benakat, 1932	1,600	—	60	NA	2,419	132,368,000	35.0
	Jrak, 1930	2,300	—	23	NA	624	55,923,000	35.0
	Raja, 1940	6,000	19	12	NA	6,254	29,419,000	38.0
	Abab, 1951	6,000	6	22	NA	1,549	37,573,000	36.0
	Ibul, 1970	5,700	5	12	NA	2,651	19,119,000	36.0
	Rambutun, 1972	4,500	8	3	NA	284	2,935,000	42.0
	Other	—	—	16	12	1,545	19,638,000	—
	Ardjuna, 1969	2,380-7,250	77	47	63	102,159	401,999,100	37.0
	Arimbi, 1972	2,943	1	10	—	2,816	18,272,400	33.0
*With Phillips	ARCO (N.E. Kalimantan)	2,600	8	—	9	2,157	10,599,200	36.0
	Bangkudulis, 1980	3,250	—	—	1	—	85,000	39.5
	PHILLIPS GROUP	5,749	—	4	6	3,065	23,923,529	39.2
	ROY M. HUFFINGTON INC.	5,800-8,500	35	—	5	5,835	28,254,020	38.0
	Badak, 1972	8,200-9,400	21	—	—	7,549	6,010,871	32.0
	Nilam, 1974	2,000-4,600	10	2	3	1,340	2,284,574	30.0
	Pamaguan, 1974	3,500-14,500	55	—	5	6,868	24,622,708	48.0
	Badak, 1972	—	—	—	44	—	594,634	—
	Other	—	—	—	—	—	—	—
	TOTAL INTEX	4,600-5,600	NA	NA	NA	29,850	*117,950,000	40.0
	*Cumulative estimate	3,000-9,000	NA	NA	NA	124,800	*395,625,000	31.0
	UNION OIL	7,500	47	17	7	49,225	354,989,704	43.0
	• Attaka, 1970	7,500	6	3	—	948	4,733,879	26.0
	• Melahin, 1972	7,000	3	2	3	642	4,313,355	31.0
	• Kerindingan, 1972	11,150	6	8	2	4,556	31,562,753	35.0
	• Sepinggan, 1973	5,100	7	2	2	1,743	5,871,639	18.0
	• Yakin, 1976	—	—	—	—	—	—	—
*With Inpx	AARNL	280-700	—	47	50	600	4,838,595	22.5
	ASAMERA (NORTH SUMATRA)	2,631	5	14	31	2,729	25,134,073	49.9
	Peudawa, 1980	3,083	2	2	7	594	1,392,668	48.1
	Other	—	—	13	14	1,350	30,412,644	—
	ASAMERA (SOUTH SUMATRA)	2,591	13	13	52	882	1,153,326	42.6
	Ramba, 1982	3,450	7	—	2	3,755	679,165	37.0
	Other	—	—	7	9	702	1,885,758	—
	CONOCO GROUP	5,595	8	15	3	19,010	36,300,000	40.0
	• Udang, 1974	3,500	—	39	2	18,900	148,657,000	34.0
	• Cinto, 1970	4,000	—	15	4	3,500	17,186,000	19.5
	• Selatan, 1971	7,500	5	38	3	15,300	19,503,000	33.0
	• Zeldi, 1971	7,000	—	5	2	1,500	5,465,000	34.5
	• Gita, 1972	2,700	—	6	—	1,900	11,609,000	18.0
	• Kitty, 1973	3,200	—	5	—	1,200	7,636,000	29.0
	• Nora, 1973	3,200	2	46	21	9,500	73,559,000	31.0
	• Rama, 1974	4,500	5	36	5	25,600	39,151,000	37.0
	• Krishna, 1979	4,500	—	4	2	2,300	2,864,000	36.0
	• Yvonne, 1980	8,000	—	16	1	8,300	4,250,000	32.0
	• Farida, 1982	8,000	1	1	3	1,400	1,412,000	33.0
	• Titi, 1982	4,400	—	15	—	12,700	2,546,000	25.0
	• Sundari, 1982	2,300	1	3	3	600	131,000	32.0
	• Duma, 1983	—	—	—	—	—	—	—

PRODUCTION BY FIELDS

WORLDWIDE PRODUCTION	Name of field, discovery date	Depth, feet	Flow	No. of wells		B'd average first 6 mo. 1983	Cumulative bbl to July 1, 1983	'API gravity								
				Artificial lift	Shut-in											
MOBIL OIL	Arun, 1971	10,500	20	1	5	75,562	123,059,342	54.7								
	PETROMER TREND	Canderawasih, 1976	3,500	...	9	...	1,904	9,675,113	28.1							
		Jaya, 1973	3,050	...	10	...	2,947	31,138,914	41.4							
		Kasim, 1973	3,350	...	23	...	9,142	36,527,597	37.4							
		Walic, 1975	2,750	1	167	15	24,897	114,028,711	33.8							
		Other	...	1	10	...	582	10,331,212	...							
	TESORO	Samboja, 1909	360- 4,380	...	27	95	452	63,468,697	21.0							
		Sanga Sanga, 1897	370- 4,950	5	108	115	3,932	260,756,599	32.0							
		Tarakan, 1906	200- 3,540	4	125	1,024	2,165	207,011,414	20.0							
	LEMIGAS	All fields, 1893-1909	2,155- 2,297	5	66	348	697	129,799,000	...							
Total Indonesia			670	4,170	3,492	1,310,093	10,730,039,276	...								
IRAN(e)	NIOC	Agha Jari, 1936	7,440	NA	NA	NA	2,435,000	31,264,666,000	34.0							
		Ahwaz Asmar, 1958	8,150						32.0							
		Ahwaz Bangestan, 1958	12,000						24.3							
		Bibi Hakimeh, 1961	4,570						29.9							
		Binak, 1959	10,440						29.9							
		Chillingar, 1974	3,350						39.3							
		Cheshmeh Khush, 1967	10,700						27.7							
		Dehluran, 1972	11,900						34.3							
		Gachsaran, 1937	3,400						31.0							
		Haft Kel, 1927	1,980						37.7							
		Karanj, 1963	5,360						33.9							
		Khang, 1961	10,900						31.6							
		Kupal, 1965	10,500						32.8							
		Lab-e Safid, 1968	4,350						35.3							
		Mansuri, 1963	7,100						28.4							
		Marun, 1963	9,400						32.6							
		Masjed-e Suleiman, 1908	1,600						39.3							
		Naft Safid, 1938	5,000						36.8							
		Paris, 1964	4,670						38.8							
		Par-e Siah, 1964	4,250						37.7							
		Pazanan, 1961	7,250						37.2							
		Rag-e Safid, 1964	7,230						28.6							
		Ramin, 1966	12,200						32.9							
		Ramshir, 1962	8,750						27.6							
		Sulabedar, 1971	3,400						30.4							
		Naft-e Shah, 1923	2,000- 3,000						43.0							
		● Bahregansar, 1960	9,000						30.0							
		● Hendiyan, 1968	11,000						23.0							
		● Nowruz, 1966	8,200						21.0							
		● Rakhsh, 1969	7,650						35.8							
		● Rostam, 1966	7,000						34.4							
		● Ardesht, 1969	2,800						27.0							
		● Cyrus, 1962	7,000						18.3							
		● Darius, 1961	11,000						34.0							
		● Fereidoon, 1966	7,000						28.5							
		● Sassan, 1965	7,500- 8,100						34.0							
		Total Iran							NA	NA	NA	2,435,000	31,264,666,000	...		
		IRAQ(e)							Ain Zalah, 1939	5,200- 6,500	NA	NA	NA	800,000	16,372,375,000	31.0
									Bai Hassan, 1953	4,800- 5,400						34.0
									Butmah, 1953	3,900						30.0
									Hamsiri, 1973	2,000						...
									Jambur, 1954	5,500-12,500						38.0
									Kirkuk, 1927	2,800- 4,200						36.0
									Naft Khaneh, 1909	3,500						42.5
									Rumaila North, 1958	10,000						34.0
Rumaila, 1953	10,800			35.0												
Zubair, 1949	11,000			34.2												
Abu Ghurab	...			27.7												
Buzurgan	...			27.7												
Jabal Fauqui	...			...												
Lahis	...			...												
Total Iraq				NA	NA	NA	800,000	16,372,375,000	...							
ISRAEL	LAPIDOTH			Heletz-Brur, 1955	5,200	8	26	130	12,135,000	28.0						
				Kochav, 1962	5,500	5	12	45	4,028,000	27.0						
		Ashdod, 1976	8,409	2	...	47	70,700	34.0								
		Zuk Tamur, 1982	6,107	1	...	13	5,400	27.0								
		Total Israel			...	16	38	235	16,238,100	...						
ITALY	AGIP	Cavone, 1979	10,663-18,068	4	2	5	3,403	2,585,164	24.0							
		Malossa, 1973	17,881-21,231	4	...	7	5,452	19,847,616	55.0							
		Pisticci-S. Cataldo, 1960	6,820- 6,880	8	...	2	589	5,848,769	11.4							
		● Gela, 1956	11,280-11,350	37	14	16	8,863	106,957,996	6.6-10.0							
		● Perla*	NA	...	...	...	...	...	...							
		● Cela Mare*	NA	...	...	...	...	...	...							
		Other	...	11	1	23	244	14,545,813	2.8-59.0							

PRODUCTION BY FIELDS

WORLDWIDE PRODUCTION	Name of field, discovery date	Depth, feet	No. of wells			B/d average first 6 mo. 1983	Cumulative bbl to July 1, 1983	*API gravity
			Flow	Artificial lift	Shut-in			
AGIP-SOMICEM	Ragusa, 1954	5,690- 5,860	...	30	14	4,103	118,973,596	19.5
	AGIP-SHELL	...	...	...	...	...	...	...
	• Nilde, 1977	6,068	2	...	...	8,026	1,444,806	39.0
	ELF ^(e)	...	...	...	...	...	...	...
	• Santa Maria a Mare, 1974	7,900	8	1	...	4,300	12,478,000	23.0
AGIP-SHELL	• Rospo Mare, 1975	4,600	3	...	4	900	413,000	11.0
	• Sarago Mare, 1979	5,200	2	...	2	650	298,000	8.0
	Total Italy	...	79	48	73	36,530	283,392,760	
*New fields								
IVORY COAST	ESSO COTE D'IVOIRE	...	...	...	...	...	...	...
	• Belier, 1975	6,500	12	...	3	6,802	7,900,000	33.0
	PHILLIPS	...	...	...	...	...	...	...
IVORY COAST	• Espoir, 1980	6,500-11,000	3	...	2	14,450	4,936,394	33.0
Total Ivory Coast			15	...	5	21,252	12,857,646	
JAPAN	JAPEX	...	...	...	...	...	...	...
	• Aga-Oki, 1972	7,590	13	...	11	990	3,733,229	24.8
	Higashi-Niigata, 1965	4,500- 9,200	17	...	8	944	6,865,893	53.9
	Sarukawa, 1958	2,000- 3,200	4	26	24	429	9,575,673	32.3
	Yoshii, 1968	8,000	13	...	12	1,467	7,224,931	61.8
	Other	...	90	4	78	1,585	26,448,950	...
	TEIKOKU OIL	...	...	...	...	...	...	...
	Kubiki, 1959	1,100- 6,400	21	77	43	520	11,952,591	29.7
	Minami-Aga, 1964	7,300- 9,600	12	2	12	500	12,816,167	38.5
	Yabase, 1933	1,100- 5,800	10	54	8	337	32,477,715	33.0
	Other	...	5	22	6	88	2,374,512	...
Total Japan			185	185	202	6,860	113,469,661	
KUWAIT ^(e)	KOC	...	...	...	...	...	...	...
	Ahmadi, 1953	4,800	...	...	...	...	...	32.9
	Bahra, 1956	8,500	...	...	...	...	...	...
	Burgan, 1938	4,800	...	...	...	...	...	32.0
	Magwa, 1951	4,800	530	...	514	750,000	20,944,923,000	33.6
	Minagish, 1959	10,000	...	...	...	...	...	34.2
	Raudhatain, 1955	8,600	...	...	...	...	...	34.7
	Sabriya, 1956	8,300	...	...	...	...	...	31.5
	Umm Gudair, 1963	9,000	...	...	...	...	...	26.7
Total Kuwait			530	...	514	750,000	20,944,923,000	
LIBYA	AGIP ^(e)	...	...	...	...	...	...	...
	Bu Attifel, 1968	14,300	20	...	10	63,500	505,097,000	41.0
	ELF	...	...	...	...	...	...	...
	Majid, 1968	9,000- 9,800	5	...	...	1,323	38,939,463	40.0
	Don Mansour Unit	5,600	3	...	2	1,280	23,231,680	32.0
	El Meheirga	10,500	2	...	3	3,924	25,610,245	46.0
	LNOC ^(e)	...	...	...	...	...	...	...
	Arshad, 1966	10,100	...	...	...	...	...	42.0
	Jebel, 1962	8,100	...	...	...	...	...	38.0
	Nasser, 1959	5,500- 7,600	...	...	...	...	...	38.0
	Lehib-Dor Marada Unit, 1965	9,500	...	...	...	...	...	50.0
	Raguba, 1961	5,400	...	...	...	...	...	43.0
	Beda, 1959	4,000	...	...	...	...	...	36.0
	Bualawn, 1972	6,000	NA	NA	NA	399,260	6,588,196,600	40.0
	Dor, 1967	6,400	...	...	...	...	...	33.2
	Kotla, 1963	5,500	...	...	...	...	...	34.0
	Sahabi B & D, 1961	9,000-10,000	...	...	...	...	...	39.0
	Sarir, 1961	9,000	...	...	...	...	...	37.2
	Amal, 1959	9,900	...	...	...	...	...	37.5
	Ora, 1962	7,250	...	...	...	...	...	40.2
	Ghani, 1978	6,000	...	...	...	...	...	40.0
	Other	...	...	...	...	...	...	...
	OASIS GROUP	...	...	...	...	...	...	...
	Bahi, 1968	3,600- 3,750	...	48	...	21,205	335,470,000	43.4
	Belhedan, 1962	7,000	...	5	...	3,947	47,136,000	33.6
	Dahra, 1959	3,100- 3,700	...	53	...	10,430	434,670,000	37.0-41.0
	Defa, 1969	5,400- 5,900	...	105	...	108,066	868,113,000	35.6
	Gialo, 1961	2,200- 6,300	...	204	...	83,225	1,754,588,000	35.7
	Harash, 1978	7,400	...	3	...	1,006	9,926,000	34.6
	Khalifa, 1978	5,400- 7,000	...	10	...	3,019	5,846,000	34.6
	Masrab, 1978	10,000	...	9	...	3,669	13,379,000	39.6
	Samah, 1961	9,000	...	8	...	8,278	296,055,000	33.4
	Waha, 1960	6,600	...	37	...	33,715	834,233,000	36.0
	Zagat, 1962	6,000	...	2	...	1,623	22,671,000	36.4
	Baiat, 1983	5,100- 5,400	...	9	...	1,350	22,000	32.2
	OCCIDENTAL	...	...	...	...	...	...	...
	Ali, 1975	3,900	...	1	1	640	4,780,590	50.0
	Almas, 1975	4,000	...	5	3	1,470	16,037,760	49.5
	Intisar A, 1967	9,750	6	...	12	24,860	677,048,840	45.0
	Intisar B, 1974	9,600	1	...	1	590	5,386,810	50.0
	Intisar C, 1967	9,650	2	...	4	1,280	85,619,750	37.5
	Intisar D, 1967	9,400	16	5	4	57,800	943,640,880	39.0
	Intisar E, 1968	5,300- 7,100	...	8	3	3,460	13,149,380	34.7
	Nafoora-Augila, 1966	2,200-10,000	15	...	40	49,240	771,234,440	35.5
	Aswad, 1978	6,250	7	...	1	4,720	10,346,340	46.0
	Sabah, 1977	5,500	1	28	9	31,200	50,024,440	42.0
	Zella, 1977	6,750	24	...	9	14,550	41,201,420	48.1
	Other	7,900- 8,900	...	1	2	340	1,543,550	40.4
Total Libya			102	541	104	935,000	14,411,198,188	

PRODUCTION BY FIELDS

WORLDWIDE PRODUCTION	Name of field, discovery date	Depth, feet	Flow	No. of wells		B/d average first 6 mo. 1983	Cumulative bbl to July 1, 1983	*API gravity
				Artificial lift	Shut-in			
MALAYSIA								
ESSO MALAYSIA	• Bekoh, 1976	5,500	28	...	3	33,900	40,972,000	47.0
	• Pulai, 1973	4,300	12	3	7	22,000	50,627,000	42.3
	• Tapis, 1975	6,700	45	4	13	62,900	110,484,000	45.0
	• Tembungo, 1971	6,000	8	2	5	9,300	19,680,000	38.0
	• Kepong, 1979	6,000	7	...	2	3,600	648,000	47.0
	• Tiong, 1978	5,800	12	...	...	16,100	3,499,000	47.0
	• Tinggi, 1980	4,400	18	...	...	19,900	3,951,000	48.0
SARAWAK SHELL BERHAD								
	• Bakau, 1971	11,000	...	3	...	1,153	6,592,725	39.0
	• Baram, 1963	9,500	...	19	18	21,054	112,174,410	40.5
	• Baronia, 1967	11,000	...	17	23	25,341	115,492,305	42.0
	• Betty, 1967	NA	...	9	...	24,307	32,426,487	38.0
	• Fairley-Baram, 1963	NA	...	2	...	545	5,849,413	40.0
	• West Lutong, 1966	NA	...	15	12	11,861	107,061,483	39.5
	• Miri, 1911	...	...	...	...	...	79,727,300	27.0
	• Temana, 1972	NA	...	17	5	14,212	13,256,744	35.0
	• Tukau, 1966	NA	...	20	20	21,433	54,502,527	29.2
	• Bokor, 1972	NA	...	9	...	2,468	447,390	35.0
SABAH SHELL	• Samarang, 1972	NA	...	42	20	53,982	157,558,315	37.0
	• South Furious, 1974	NA	...	5	10	3,114	6,125,872	30.0
	• Erb West, 1972	NA	...	11	2	10,250	4,344,236	30.0
	• St. Joseph, 1975	NA	...	4	2	6,471	1,711,096	32.0
	• Barton, 1971	NA	...	4	...	5,808	2,719,743	37.0
Total Malaysia				316	142	369,699	929,851,046	
MEXICO								
PEMEX	All fields	...	1	21	23	535	32,650,660	47.0
NORTH ZONE, NE								
NORTH ZONE, N.								
	• Arenque, 1970	11,362	19	...	6	7,108	66,588,173	26.0
	Constituciones, 1956	6,350	53	82	87	7,919	68,688,718	17.0
	Ebano-Panuco, 1901	1,450	140	210	171	4,824	937,740,448	12.0
	Tamaulipas	4,200	61	78	87	7,749	66,413,311	19.0
	Other	...	97	102	94	484	22,768,517	...
NORTH ZONE, S.								
	• Chicontepec, 1973	4,264	33	4	56	4,466	7,610,114	34.1
	• Isla de Lobos, 1963	6,875	2	...	...	384	20,583,163	40.0
	• Marsopa, 1974	10,198	7	...	3	1,962	12,609,601	39.0
	Naranjos-C. Azul, 1909	1,800	199	...	25	7,749	1,203,718,231	22.0
	Tres Hermanos, 1959	6,960	22	...	71	4,661	102,778,537	21.0
	Other	...	91	24	64	629	25,444,761	...
CENTRAL ZONE, POZA RICA								
	• Atun, 1966	9,040	2	...	6	1,598	34,949,064	37.0
	• Bagre, 1973	10,919	6	...	3	5,063	36,913,337	33.0
	Escolin, 1942	7,216	...	100	84	16,731	202,169,003	26.3
	Hallazgo, 1955	10,170	...	38	37	5,321	70,967,875	25.0
	Jilapa, 1958	7,390	...	26	46	887	27,340,435	24.0
	Mecatepec, 1941	7,544	1	40	37	2,969	133,758,429	29.8
	Miquetla, 1959	6,480	10	63	28	1,763	24,319,008	35.0
	Poza Rica, 1930	7,090	6	148	84	25,418	865,103,082	35.0
	Pres. Aleman, 1949	8,036	71	47	53	3,088	30,191,050	26.0
	Remolino, 1962	10,745	...	37	48	1,151	20,410,962	29.5
	San Andres, 1956	10,410	8	108	109	19,386	328,185,914	29.0
	Other	...	77	136	266	7,227	93,078,250	...
CENTRAL ZONE, N. FAJA DE ORO								
	Huautempan, 1955	4,081	4	...	16	50	25,642,632	21.0
	Muro, 1965	3,964	9	...	3	648	19,056,656	17.0
	Ordoñez, 1952	5,220	10	...	8	1,359	56,817,815	21.0
	Cotepec, 1953	3,737	13	...	2	440	19,411,745	20.0
	Santa Agueda, 1953	4,780	15	...	28	1,547	101,606,326	16.0
	Other	...	44	4	45	1,541	56,836,855	...
CENTRAL ZONE, VERACRUZ								
	Matapionche, 1974	11,129	31	...	22	7,617	19,318,584	37.0
	Other	...	23	...	49	3,158	28,087,932	...
SOUTHERN ZONE, AGUA DULCE								
	Blasillo, 1967	7,216	17	20	17	6,623	20,220,645	40.0
	Circo Presidentes, 1960	6,862	11	74	43	9,630	240,046,037	35.0
	Burro, 1931	2,200	...	18	10	1,000	21,078,236	26.0
	Venta, 1954	4,730	6	15	44	1,616	57,344,829	41.0
	Ogarrio, 1957	5,790	17	50	59	8,221	128,912,896	38.0
	Otates, 1965	7,469	2	8	3	1,497	23,610,848	39.0
	Rodador, 1971	11,398	7	14	5	2,277	6,350,900	26.0
	Sanchez Magallanes, 1957	4,240	4	93	141	8,303	127,226,113	27.0
	San Ramon, 1967	9,517	5	42	8	6,391	53,224,275	30.0
	Tonalá, 1928	1,770	...	45	23	1,661	76,518,070	28.0
	Other	...	...	2	5	591	39,444,000	...
SOUTHERN ZONE, COMALCALCO								
	Agave, 1977	13,450	11	...	4	34,953	75,337,084	41.7
	Arroyo Zanapa, 1978	14,599	1	...	...	2,542	7,337,084	38.9
	Arteza, 1977	11,800	1	...	4	4,189	26,910,614	26.4
	Ayapa, 1972	5,200	3	...	1	478	4,913,597	7.2
	Cacho Lopez, 1977	14,250	...	...	1	120	2,269,721	39.0
	Cactus, 1972	14,100	12	...	11	16,398	253,002,437	31.5
	Carrizo, 1962	3,500	1	6	...	591	9,769,345	23.3
	Castarrical, 1967	10,080	1	28	18	1,598	36,038,901	29.3
	Comopa, 1979	14,432	6	...	...	10,919	10,464,132	44.5

PRODUCTION BY FIELDS

WORLDWIDE PRODUCTION	Name of field, discovery date	Depth, feet	Flow	No. of wells		B/d average first 6 mo. 1983	Cumulative bbl to July 1, 1983	*API gravity
				Artificial lift	Shut-in			
MEXICO	Copano, 1977	11,890	3	—	—	8,385	7,506,744	43.9
	Cunduacan, 1974	13,775	12	—	11	46,577	358,141,951	28.9
	El Golpe, 1963	3,500	2	44	22	3,988	71,611,027	25.7
	Giraldo, 1977	15,225	18	—	1	61,975	71,139,428	37.0
	Irde, 1974	13,775	11	—	1	33,985	116,319,460	28.5
	Mecoacan, 1957	2,203	5	11	15	428	36,122,860	8.6
	Mundo Nuevo, 1977	11,800	5	—	2	6,844	19,704,356	46.0
	Nispero, 1974	14,100	6	—	5	15,826	97,792,838	34.4
	Ojacaque, 1977	11,150	8	—	10	4,573	91,454,625	29.1
	Paredon, 1978	15,690	6	—	1	49,754	52,836,277	39.8
	Platanal, 1978	15,900	—	—	—	—	2,967,641	30.2
	Rio Nuevo, 1975	14,950	7	—	—	22,424	48,773,710	34.8
	Samaria (Cret), 1973	14,209	43	—	8	193,153	821,199,033	31.0
	Santuario, 1966	9,617	5	10	4	2,365	29,682,692	37.0
	Sitio Grande, 1972	13,766	13	—	5	44,477	238,933,871	35.0
	Sunuapa, 1978	12,887	2	—	4	2,359	21,525,135	32.8
	Tintal, 1968	5,904	6	—	1	403	3,965,675	22.0
	Topan, 1978	11,172	1	—	1	855	1,287,003	25.4
	Tupilco, 1959	9,685	7	29	16	2,365	44,821,389	27.0
	Belota, 1982	17,056	1	—	—	5,768	2,855,295	41.0
	Cardenas, 1979	17,548	10	—	1	85,380	43,754,378	38.0
	Chiapas, 1979	12,136	6	—	—	15,297	16,074,730	42.0
	Fenix, 1979	17,876	5	—	—	13,718	15,632,990	40.0
	Iris, 1979	14,432	6	—	1	5,900	7,226,273	39.2
	Juio, 1980	17,548	1	—	—	29,745	18,101,475	32.0
	Muspac, 1982	9,676	1	—	—	522	590,562	57.0
	Tapijulapa, 1982	15,613	1	—	—	102	50,232	39.8
	Mora, 1981	—	1	—	—	3,164	2,213,023	38.1
	Caparroso, 1982	18,368	NA	NA	NA	264	60,617	41.2
	Tecminoacan, 1983	19,519	NA	NA	NA	2,950	533,568	37.5
	Jolote, 1983	18,119	NA	NA	NA	642	115,799	39.4
	Other	—	—	2	10	642	10,436,066	—
	SOUTHERN ZONE, EL PLAN	—	—	—	—	—	—	—
	Agata, 1956	3,830	1	4	10	396	11,347,500	—
	Bacal, 1976	3,500	23	—	14	26,871	66,021,519	35.0
	Concepcion, 1974	1,600	4	4	7	937	3,655,144	31.0
	Cuchapa, 1935	2,200	8	66	37	8,378	115,210,225	30.0
	El Plan, 1931	1,700	—	65	12	2,667	150,783,415	30.0
	Lacamango, 1973	1,700	11	10	6	1,736	8,834,003	26.3
	Los Soldados, 1953	4,492	4	15	3	1,176	22,985,729	32.0
	Other	—	4	7	4	371	37,375,677	—
	SOUTHERN ZONE, NANCHITAL	—	—	—	—	—	—	—
	Ixhuatlan Ote., 1965	1,960	3	10	22	1,478	8,935,373	22.6
	Moloacan, 1962	500	5	161	72	2,893	18,766,794	22.3
	Other	—	—	—	112	6	17,475,596	—
	GULF OF CAMPECHE	—	—	—	—	—	—	—
	• Cantarell, 1976	8,528	48	—	—	905,678	1,110,213,663	21.3
	• Abkatun, 1978	11,800	14	—	—	444,477	255,869,863	30.0
	• Ku, 1979	10,000	4	—	—	185,888	96,034,047	22.0
	• Pol, 1979	12,600	3	—	—	108,804	61,876,460	35.0
	• Chuc, 1982	13,100	NA	NA	NA	24,103	6,960,288	35.0
Total Mexico			1,484	2,121	2,476	2,655,719	10,227,554,961	
MOROCCO^(e)								
MOROCCO	Haricha, 1957	3,000	—	—	—	180	3,117,950	40.0
	Other	—	—	—	—	—	12,554,000	—
	Total Morocco	—	—	—	—	180	15,731,956	
NETHERLANDS								
NETHERLANDS	UNION	—	—	—	—	—	—	—
	• Helm, 1979	4,400	1	4	—	4,964	1,338,061	14.8
NETHERLANDS	• Heider, 1980	4,800	3	6	—	9,529	2,251,167	20.4
NETHERLANDS	NAM (SHELL ESSO)	—	—	—	—	—	—	—
	DeLier-Munster, 1955	8,200	28	6	—	872	15,768,494	33.2
	Berkel, 1954	NA	8	—	—	1,080	476,243	32.1
	Ysleim-Ridderkerk, 1956	5,200	84	—	—	5,480	81,275,618	18.0
	Pynacker, 1955	NA	6	1	—	231	5,441,661	36.3
	Wassenaar, 1956	4,200	35	3	—	2,767	43,099,458	18.6
	Zoetermeer, 1957	3,200	23	3	—	593	8,963,371	16.4
	Schoonebeek, 1943	2,500	395	14	—	16,434	211,484,369	24.8
	Other	—	30	25	—	146	4,659,817	—
	Total Netherlands	—	623	52	42,096	374,758,259		
NEW ZEALAND								
NEW ZEALAND	SHELL-BP-TODD	—	—	—	—	—	—	—
	• Kapuni, ^(a) 1959	10,318-11,775	5	2	3	5,970	29,000,000	54.0
	MAUI DEVELOPMENT LTD.	—	—	—	—	—	—	—
	• Maui, ^(a) 1969	8,615-11,068	9	—	3	7,350	8,100,000	58.0
NEW ZEALAND	PCNZ	—	—	—	—	—	—	—
	• McKee, 1981	7,848	—	—	5	—	84,776	35.0
	• Kaimiro, ^(a) 1982	11,856-11,900	—	—	1	—	—	—
Total New Zealand			14	2	12	13,320	37,284,776	
NIGERIA								
NIGERIA	AGIP-PHILLIPS	—	—	—	—	—	—	—
	Akri, 1977	9,600-10,600	7	—	4	6,669	45,780,597	39.9
	Ebegoro, 1976	11,500-12,000	5	—	4	9,371	44,598,734	35.7
	Ebocha, 1965	8,000-10,900	8	—	8	6,712	93,732,092	38.5
	Kwale, 1968	10,000-11,500	2	—	2	1,058	1,114,124	44.3

*Test production

PRODUCTION BY FIELDS

WORLDWIDE PRODUCTION	Name of field, discovery date	Depth, feet	Flow	No. of wells		B/d average first 6 mo. 1983	Cumulative bbl to July 1, 1983	API gravity
				Artificial lift	Shut-in			
	M'Bede, 1966	7,300-9,400	7		7	10,737	133,668,950	41.1
	Obama, 1975	11,600-14,300	7		1	16,630	63,548,963	38.2
	Obiafu, 1973	9,300-12,200	10		7	7,499	60,582,944	41.3
	Obrikom, 1973	8,000-10,000	5		7	2,910	43,656,886	41.5
	Odiuri, 1972	12,500	2			3,553	7,558,272	44.8
	Okpai, 1968	10,000-12,000	7		1	3,460	9,656,288	42.3
	Oshi, 1974	9,600-11,300	9		2	6,250	46,839,390	39.5
	Tebidaba, 1975	10,300-13,300	7		3	15,000	61,126,478	35.5
	Umuoru, 1975	14,100	2		1	947	1,064,223	43.0
	Agwe, 1977	10,800	1			525	833,133	55.0
	Clough Creek, 1977	10,000-12,400	8			19,635	4,536,550	43.0
	Other		4		14	1,163	35,255,741	
PHILLIPS	Gilli-Gilli, 1967	7,600-14,000	2		1	1,050	1,592,185	47.4
ASHLAND	Izombe, 1974	9,500	18		8	13,936	28,083,738	43.2
	Ossu, 1974	9,500	4		5	1,212	1,856,523	44.0
	Other				10			
ELF	Aghigo, 1972	6,000-8,500	1	9	1	4,344	15,305,333	24.6
	Okoko, 1967	6,000-7,500	2	3	7	3,799	15,473,246	19.0
	Obodo-Jatumi, 1966	6,000-11,000	8	2	4	8,876	40,355,369	29.0
	Upomami, 1965	6,000-7,000		7	1	2,347	10,602,766	17.5
	Obagi, 1964	6,000-10,000	29	3	17	57,915	255,498,000	24.0
	Erema, 1972	9,800	1			7,145	4,175,876	30.0
GULF	Abiteye, 1970	5,750-9,400	11		7	12,700	44,943,000	37.8
	• Delta, 1965	5,600-9,500	22		5	16,400	136,839,000	34.0
	• Delta South, 1965	7,100-10,179	13		14	19,100	219,315,000	38.6
	• Isan, 1970	5,900-9,000	7		4	4,000	37,854,000	39.4
	Makaraba	7,100-12,005	19		7	14,800	50,725,000	31.5
	• Malu, 1969	4,800-6,300	11		7	11,600	71,049,000	40.0
	• Mefa, 1965	8,570-12,030	4		1	1,500	10,004,000	37.1
	• Meji, 1965	5,200-10,900	19		3	11,800	118,770,000	32.9
	• Meren, 1965	5,000-7,500	22		28	17,700	393,754,000	31.3
	• Okan, 1964	5,500-9,245	52		13	30,400	368,601,000	36.0
	• Parabe Eko, 1968	4,500-8,200	14		9	8,400	88,095,000	36.7
	• Utonana, 1971	7,400-9,165	2		3	1,900	6,369,000	35.6
	• W. Isan, 1971	7,625-10,229	8		1	3,300	28,814,000	38.1
	Yorla South, 1974	11,389-12,635			2		823,000	42.0
	Jisike, 1975	6,300-7,600	3			5,700	3,080,000	44.0
	Robertkin, 1964	11,484-13,190			2		1,651,000	
	• Tapa, 1978	8,150-10,842	10			8,300	7,577,000	36.0
MOBIL	• Adua, 1967	6,970	4		1	10,769	29,842,521	30.3
	• Asabo, 1966	5,600	8		5	16,621	131,261,417	32.4
	• Ekpe, 1966	8,200	9		8	14,196	161,453,233	30.3
	• Ekpe-WW, 1977	6,810	6		1	5,709	19,047,205	30.3
	• Eku, 1966	5,420	3		3	4,595	12,174,585	30.8
	• Enang, 1968	6,600	21		2	17,407	84,863,459	35.1
	• Etim, 1968	6,200	9			7,607	79,559,511	32.9
	• Idoho, 1966	9,020	3		1	179	25,807,211	30.8
	• Imu, 1966	5,850	9		1	14,448	109,946,445	37.8
	• Mfem, 1967	5,200	3			3,980	16,765,156	36.1
	• Ubit, 1968	5,400	31		14	24,151	132,314,567	36.1
	• Unam, 1968	5,180	9			7,144	29,758,950	33.5
	• Utue, 1966	5,700	6		1	6,589	54,240,689	36.8
	• Isobo, 1968	4,345	4			5,055	2,889,788	30.8
	• Iyak	NA	6					NA
INPEX*	Ogharefe, 1973	9,900	4			4,563	19,560,457	47.4
SHELL (MIDWEST)	Ugh-Ogini, 1964	5,860	8		7	1,710	17,271,310	19.0
	Ugh-Uzere-East, 1960	8,500	11		5	4,442	7,450,912	23.0
	Ugh-Uzere-West, 1964	8,500	11			5,261	90,702,258	23.0
	Ugh-Olomoro, 1963	7,000-10,000	23		7	12,518	245,274,968	22.0
	Ugh-Oweh, 1964	12,300	9		2	2,660	86,917,925	28.0
	Ugh-Kokori, 1960	8,000-9,800	23		4	15,415	283,907,010	42.0
	Ugh-Afiesere, 1966	8,000-9,000	27		6	7,996	95,795,469	22.0
	Ugh-Eniemu, 1961	12,500	1		10	1,823	33,896,318	26.0
	Ugh-Ughelli-East, 1959	11,800	7		4	4,037	83,164,275	35.0
	Ugh-Ughelli-West, 1963	7,400-10,200	6			1,975	27,299,815	21.0
	Ugh-Utorogu, 1964	9,000	13		7	4,570	117,349,211	25.0
	Ugh-Oroni, 1964	12,000	4		3	1,370	23,491,518	22.0
	Ugh-Wari-River, 1961	12,264	2		1	838	12,850,257	31.0
	Ugh-Ewreni, 1968	10,900	6		4	352	32,183,290	28.0
	Ugh-Isoko, 1960	NA	1		1	1,170	4,675,124	19.0
	Forc-Oddi, 1967	10,980	21		9	19,935	170,790,863	37.0
	Forc-Opukushi, 1963	7,823	11		4	26,170	71,918,757	29.0
	Forc-Jones Creek, 1967	7,000-9,000	19		12	21,571	343,253,598	29.0
	Forc-Opuama, 1973	NA	5			3,015	19,281,707	41.0
	Forc-Egwa, 1967	9,350	13		10	9,019	112,395,722	37.0
	Forc-Forcados Yokri, 1968	10,859	42		53	46,484	431,223,404	22.0
	Forc-Batan, 1968	11,000	9			5,461	48,266,258	27.0
	Forc-Escravos Beach, 1969	9,931	6		7	6,328	45,397,998	36.0
	Forc-Otumara, 1969	8,176	17		4	20,846	113,155,371	25.0
	Forc-Saghara, 1970	8,590	5		1	5,387	23,392,450	31.0
	Forc-Ajuju, 1970	13,324	2			813	8,534,423	27.0
	Forc-Benisede, 1973		15		3	32,641	57,915,148	23.0

PRODUCTION BY FIELDS

WORLDWIDE PRODUCTION	Name of field, discovery date	Depth, feet	Flow	No. of wells		B/d average first 6 mo. 1983	Cumulative bbl to July 1, 1983	API gravity
				Artificial lift	Shut-in			
SHELL (EAST)	Node-Sapele, 1970	12,788	12	...	7	7,783	87,619,021	42.0
	Node-Oben, 1972	12,036	17	...	4	23,424	71,219,233	40.0
	Forc-Opukushi N., 1977	NA	1	...	1	4,140	1,320,253	30.0
	Other	...	3	...	4	47	30,559,253	...
	Phi-Bomu, 1958	6,500-7,500	27	...	15	11,678	333,147,632	36.0
	Phi-Imo River, 1959	5,800-10,000	36	...	7	24,340	406,751,147	32.0
	Phi-Nkali, 1963	12,000	4	...	6	3,542	26,141,287	42.0
	Phi-Elelenwa, 1959	11,000	6	...	5	4,847	27,268,306	39.0
	Phi-Umuechem, 1969	5,800-10,700	12	...	4	3,849	136,424,035	36.0
	Phi-Apara, 1960	9,000	4	...	3	3,556	18,529,694	36.0
	Phi-Bodu-West, 1959	9,700	9	...	2	2,547	60,266,286	29.0
	Phi-Afam, 1956	6,000	13	...	3	9,266	49,986,450	45.0
	Phi-Yorla, 1970	11,917	8	...	3	4,410	50,321,842	44.0
	Phi-Bonny, 1959	12,254	12	...	3	9,296	76,798,106	36.0
	Phi-Cawthorne Channel, 1963	11,000	21	...	8	19,373	205,543,091	38.0
	Phi-Ekulama, 1958	10,483	10	...	3	19,457	143,327,833	32.0
	Phi-Soku, 1958	11,500	1	...	8	7,960	91,763,425	31.0
	Phi-Orubiri, 1971	NA	...	...	...	...	...	38.0
	Egb-Oguta, 1965	10,300	14	...	11	11,775	112,744,856	46.0
	Eade-Utapat South, 1974	NA	...	...	3	4,396	23,929,334	44.0
	Eade-Opobo South, 1974	NA	...	...	...	1,234	7,015,950	44.0
	Cesw-Nun River, 1960	NA	4	...	2	2,697	26,046,751	39.0
	Cesw-Etelebou, 1971	12,000	9	...	...	19,166	97,341,961	33.0
	Cesw-Kolo Creek, 1960	12,000	14	...	10	11,840	88,607,334	42.0
	Cesw-Diebu Creek, 1966	NA	11	...	1	8,842	86,423,345	43.0
	Phi-Isimiri, 1964	5,900-11,000	6	...	...	2,505	33,511,325	28.8
	Phi-Onne, 1965	10,384	3	...	...	...	7,735,491	29.0
	Phi-Obigbo-North, 1963	6,500-10,000	19	...	...	9,907	145,018,375	22.0
	Phi-Ajokpori, 1967	NA	1	...	1	866	3,691,549	29.0
	Phi-Agbada, 1960	8,000-12,000	43	...	4	17,394	139,171,013	32.1
	Phi-Akuba, 1967	NA	1	...	...	546	3,493,256	29.0
	Cesw-Adibawa, 1967	11,950	22	...	2	14,831	48,192,864	26.0
	Cesw-Adibawa NE, 1973	NA	3	...	...	1,078	8,744,897	26.0
	Cesw-Ubie, 1961	14,380	4	...	...	3,986	22,094,887	28.0
	Phi-Obeaku, 1975	NA	2	...	2	2,212	11,269,791	45.0
	Cesw-Nembe Creek, 1973	NA	41	...	3	41,634	100,321,052	35.0
	Phi-Akaso, 1979	NA	1	...	...	592	749,431	30.0
	Other	...	19	...	19	1,805	448,772,785	...
TEXACO-CHEVRON	• Pennington, 1965	5,000-10,400	2	...	8	972	21,169,000	37.5
	• Middleton, 1972	5,000-7,000	1	...	6	301	10,581,000	37.5
	• North Apoi, 1973	4,000-8,100	18	...	4	25,314	95,664,000	36.5
	• Funwa, 1978	5,000-7,000	13	...	...	8,543	3,417,000	37.5
Total Nigeria			1,272	24	585	1,129,114	9,584,713,795	
NORWAY								
PHILLIPS*	• Ekofisk, 1969	10,000	37	...	3	160,581	715,784,308	41.1
	• West Ekofisk, 1970	10,300	8	...	2	14,396	66,643,060	43.9
	• Cod, 1968	9,500	6	...	...	7,721	13,239,349	55.0
	• Tor, 1970	10,000	9	...	4	21,895	89,460,863	38.0
	• Albuskjell, 1972	10,400	16	...	2	17,902	36,115,339	45.0
	• Edda, 1972	10,480-10,600	7	...	...	6,160	17,707,331	41.5
	• Eldfisk, 1970	9,350-10,000	27	...	2	69,040	121,333,837	37.6
	• Statfjord, 1974	7,700	17	...	3	*318,100	*203,857,000	39.0
	• Valhall, 1972	8,200	4	...	...	9,650	2,340,000	35.0
	• Murchison, 1975	...	13	...	2	*17,633	*14,885,000	...
Total Norway			144	...	18	643,078	1,281,366,087	
OMAN								
PDO	Al Huwaisah, 1969	5,500	35	...	3	22,567	133,799,364	38.9
	Fahud, 1963	2,000-6,080	104	...	59	66,016	640,020,802	32.8
	Ghaba North, 1972	2,500-6,100	9	...	4	6,941	35,299,744	38.4
	Habur, 1975	2,500-5,800	1	...	2	507	3,817,041	16.3
	Lekhwar, 1974	7,500	18	...	21	7,372	34,381,441	37.8
	Natih, 1963	7,500	31	...	19	28,877	296,862,222	32.0
	Qarn Alam, 1972	1,370-6,500	4	...	2	1,958	16,603,139	16.5
	Saih Nihaydah, 1972	8,700	15	...	...	22,681	104,441,272	40.0
	Saih Rawi, 1973	5,000-10,300	11	...	1	12,554	69,809,897	41.5
	Yibal-Shuaiba, 1963	8,465	97	...	5	98,022	388,003,202	38.3
	Marmul, 1977	3,400-11,200	99	...	11	45,180	36,411,870	22.1
	Qaharir, 1978	7,500	13	...	7	7,841	8,711,721	30.3
	Mahjour, 1979	11,700	1	...	1	656	626,859	41.0
	Birba, 1978	10,500	...	...	5	2,685	1,672,143	31.0
	Rahab, 1978	7,400	8	...	4	964	1,159,828	22.2
	Qata, 1979	6,200	2	...	8	963	630,896	29.4
	Rima, 1979	NA	23	...	...	29,313	6,709,360	34.0
	Other	...	3	...	5	450	394,436	...
	Sahmah, 1978	12,400	3	...	1	11,800	10,907,000	44.5
Total Oman			477	158	367,387	1,790,252,237		

*Formerly Pan Ocean. Interest purchased by Inpex from Marathon.

*Norway's 84.09% share of MOBIL GROUP production from unitized field only. †Norway's 16.25% share of production from unitized field only. ‡Includes about 45,000 b/d of NGL.

PRODUCTION BY FIELDS

WORLDWIDE PRODUCTION	Name of field, discovery date	Depth, feet	Flow	No. of wells		B/d average first 6 mo. 1983	Cumulative bbl to July 1, 1983	°API gravity
				Artificial lift	Shut-in			
PAKISTAN								
UNION TEXAS	Khashkeli, 1981	3,500	4		3	4,218	1,573,862	39.0
PAKISTAN PETROLEUM	Adhi, 1978	9,219-9,245	2			386	237,512	30.0
OGDC	Toot, 1968	14,900	8			2,595	6,055,243	38.0
PAKISTAN OILFIELDS LTD.	Baikassar, 1946	8,398		4	9	560	30,779,280	26.0
	Dhulian, 1936	8,899	13		36	74	41,270,353	48.0
	Joyamir, 1944	6,900		1	2	295	5,320,173	15.0
	Meyal, 1968	12,514	6		4	5,309	23,489,778	46.0-47.0
	Other					7	4,153,403	29.0
Total Pakistan			33	5	54	13,444	112,879,604	
PERU								
BELCO	• Peña Negra, 1960	3,000-8,500	23	112	92	10,862	84,650,936	38.0
	• Lobitos, 1960	3,500-7,500	16	104	84	9,412	34,422,217	38.0
	• Litoral, 1955	1,500-6,000	9	86	53	3,918	30,863,087	36.0-40.0
	• Providencia, 1967	3,000-7,000	5	38	40	1,008	18,595,483	38.0-40.0
	• Other				7	7	145,739	
OCCIDENTAL	Capahuán Sur, 1973	11,800-12,900		13	13	26,206	103,217,425	35.6
	Dorissa, 1978	9,800-10,600	1	5	6	14,255	16,898,263	34.0
	Forestal, 1973	9,000-9,900		8	2	13,335	21,360,114	26.7
	Huayuri Sur, 1977	10,000-10,800		6	6	3,262	10,230,486	29.3
	San Jacinto, 1978	7,200-7,950		2	1	758	137,226	13.1
	Shiwiyacu, 1973	9,100-10,100		8	7	8,236	31,217,705	21.2
	Bartra, 1979	8,000-8,930		11	5	6,333	5,088,866	11.5
	Jibaro, 1974	10,110-11,155		1	2	2,095	409,420	11.3
	San Jacinto, 1978	8,783-9,760	1	8	9	12,014	9,135,810	23.5
	Other			1	7	205	1,130,235	
OCCIDENTAL BRIDAS	Talara area*	1,343-6,080	1	1,890	431	13,320	135,124,205	36.0
PETROPERU	Talara-Lima area, 1869-1905	2,000-9,000	100	792	4,598	12,651	898,979,314	33.4
	Corrientes, 1971	10,000-12,600	10	10	7	14,071	42,253,538	29.5
	Pavayacu, 1972	9,600-11,300		14		6,147	8,926,406	30.5
	Nueva Esperanza, 1980	10,200-10,700	3	1	1	4,623	1,395,317	45.0
	Yanayacu, 1974	11,400-13,600		9	1	2,315	1,408,248	19.2
	Capirona, 1972	9,800-12,000		4	1	1,824	1,516,130	25.6
	Maquia, 1957	2,100-2,400	4	19	3	677	10,158,878	37.4
	Other			14	20	317	14,312,811	
Total Peru			173	3,156	5,396	167,941	1,481,577,859	
PHILIPPINES								
OXY	• South Nido, 1977	6,660-6,945	4		1	1,620	14,162,000	27.0
	• Matinloc, 1979	6,800	4	1		7,650	2,534,900	42.9
AMOCO	• Cadiao, 1977	5,800	2			5,433	3,554,000	48.0
Total Philippines			10	1	1	14,703	20,250,900	
QATAR ^(e)								
QGPC	• Bul Hanine, 1970	6,000	9		4			35.0
	Dukhan, 1940	6,500	87		21			41.1
	• Idd El Shargi, 1960	4,500-8,250	15		19	244,000	3,504,982,000	35.0
	• Maydan-Mahzam, 1963	7,000	14		5			38.0
Total Qatar			125		49	244,000	3,504,982,000	
SAUDI ARABIA ^(e)								
ARAMCO	Abqari, 1940	6,690						37.0
	Abu-Hadriya, 1940	9,340						35.0
	• Abu-Safah, 1963	6,600						30.0
	• Berr, 1964	8,300						32.0-34.0
	Dammam, 1938	4,800						35.0
	Fadhili, 1949	8,050						39.0
	Ghawar, 1948	6,920						34.0
	Harmaliyah, 1971	8,430						35.0
	Khurais, 1957	5,200						33.0
	Khursaniyah, 1956	6,560	NA	NA	NA	4,137,000	47,196,915,000	31.0
	• Manifa, 1957	7,950						29.0
	• Marjan, 1967	6,800						33.0
	• Qatrit, 1945	7,100						33.0-34.0
	• Safaniyah, 1951	5,100						27.0
	• Zuluf, 1965	5,800						32.0
Total Saudi Arabia			NA	NA	NA	4,137,000	47,196,915,000	
SHARJAH								
CRESCENT	• Mubarek, 1972	12,650-12,990	1	4	2	6,942	69,567,189	37.0
AMOCO	Saaja, 1980	10,200	7			28,300	8,700,000	50.0
Total Sharjah			8	4	2	35,242	78,267,189	
SPAIN								
SHELL ESPANA	• Amposta Marino North, 1970	10,000	1	1		1,548	53,400,000	37.0
CHEVRON	• Casablanca, 1975	8,000				43,180	25,922,000	34.0
AMOSPAIN	Ayoluengo, 1964	4,000		31	6	1,750	12,032,000	37.0
SHELL CAMPSA	• Castellon B, 1972	9,000	1			6,485	11,053,000	35.0
ENIEMSA	• Dorada, 1975	6,700	2			5,726	11,974,225	21.0
Total Spain			9	32	6	58,689	114,381,225	

PRODUCTION BY FIELDS

WORLDWIDE PRODUCTION	Name of field, discovery date	Depth, feet	Flow	No. of wells		B/d average first 6 mo. 1983	Cumulative bbl to July 1, 1983	*API gravity
				Artificial lift	Shut-in			
SYRIA	S.P.C. Alian, 1974	5,600						
	Gbebeh, 1976	2,000						13.0
	Jebissah, 1968	2,000						19.8
	Karatchok, 1968	6,000	NA	NA	NA	165,000	818,900,000	19.0
	Rumeilan, 1962	5,600						22.0
	Souedie, 1959	5,500						23.0
	Tichrine, 1976	2,700						24.0
	Total Syria		NA	NA	NA	165,000	818,900,000	15.9
THAILAND	UNION OIL Erawan, 1973	7,000	39		5	6,805	3,365,700	56.0
	THAI SHELL Sinit, 1981	5,258-5,976	6			3,870	696,380	41.0
	Total Thailand		45			10,675	4,062,080	
TRINIDAD	AMOCO Teak, 1972	15,191	2	33		30,863	164,735,000	29.3
	Samaan, 1972	11,780	8	29		25,164	145,406,000	36.8
	Pou, 1974	11,650	16	19		26,317	112,083,000	34.0
	Cassia, 1973	12,700	1			260	47,800	45.0
	T.N.A. Soldado, 1955	11,000	73	221		36,681	400,752,223	24.8
	Fortin Offshore (FOS), 1954		7	10		298	6,482,879	
	TRINIDAD-TESORO Palo Seco-Erin McKenzie, 1976	12,718	43	440		8,515	103,059,168	20.2
	Fyzabad, 1918	11,000	9	326		3,771	163,934,618	21.5
	Coora Quarry, 1936	14,000	4	182		1,953	87,591,501	23.8
	Galeota, 1972	6,304		41		3,150	9,539,223	25.5
	Other		12	336		4,224	61,782,533	
	TEXACO Barrackpore, 1911	730-7,500	7	82	93	844	72,054,931	32.8
	Guayaguayare, 1903	1,300-11,100	15	41	65	1,408	49,750,908	29.9-41.2
	Forrest Reserve, 1913	500-10,750		96	173	1,511	84,032,840	33.7
	Oropouche, 1944	500-11,000	11	310	303	5,280	277,640,766	23.0
	Palo Seco & Erin, 1926-29	2,700-9,100	21	37	300	300	6,287,156	38.6
	Trinity, 1956	250-12,700	14	96	197	2,645	99,961,696	21.2
	Area IV & Guapo, 1913	1,400-9,700	14	37	322	322	14,732,881	32.2
	TRINTOC Parrylands, 1913	10,626	15	51		1,171	36,598,292	25.5
	Point Fortin C & W, 1907	10,626	31	57		1,374	37,353,690	30.2
	Point Fortin E, 1929	11,000	24	94		2,016	36,720,820	22.0
	Penal, 1936	11,000	3	52		1,101	25,118,254	22.2
	Catshill, 1950	11,067	24	59		1,248	60,111,895	22.4
	Other	9,693	1	41		422	22,406,436	38.3
	P.C.O.L. All fields		11	23		576	18,915,300	
			2	82		293	19,603,026	
	Total Trinidad		333	2,756	905	161,707	2,116,703,473	
TUNISIA	ELF(e) Ashtart	10,500	12	5	1	28,700	131,494,000	29.0
	Douleb Semmaina	1,500-2,500		13	2	1,200	16,017,000	40.0
	Tamesmda	2,500		3		310	1,556,000	33.0
	CFP Sidi El Hayem, 1971	7,500-7,800				2,500	16,676,630	33.0
	Other						655,000	
	PETROFINA Laarich, 1979	NA	NA	NA	NA			
	Makhrouga, 1980	NA	NA	NA	NA	1,395	252,500	NA
	Debbeh, 1980	NA	NA	NA	NA			
	SHELL TUNIREX AGIP(e) Tazerka, 1979	NA	4			10,456	2,217,355	30.0
	El Borma, 1964	8,250-8,900	40	13		68,000	375,937,000	42.0
	Chouech es Saida, 1971	12,600	1			650	1,910,000	44.0
	Total Tunisia		57	34	3	113,211	546,715,485	
TURKEY	TURKSE SHELL Barbes, 1971	7,200	10	3		2,009	12,585,245	29.7
	Beykan, 1964	5,200	23	4		3,827	52,876,629	33.2
	Kayakoy, 1960	6,000	14	5		2,538	16,655,519	38.2
	Kayakoy W., 1964	5,300	10	7		2,396	24,923,037	34.7
	Kurkan, 1963, and Kurkan S., 1965	4,500	25	7		6,114	43,849,978	31.4-34.5
	Malatepe, 1970	5,400	7	2		773	5,387,632	32.7
	Sahaban, 1965	5,500	6	5		493	17,835,840	34.5
	Sincan, 1979	4,900	3	1		897	1,457,687	31.4
	Yatir Yatir-E., 1973	5,246	4	5		854	4,079,140	30.9
	Yenikoy E., 1974	NA	2			455	3,192,929	31.3
	Other		4	3		282	5,118,849	
	MOBIL Selimo, 1964	3,200	16	1		4,352	56,516,000	34.2
	Other						2,376,333	
	TPAO Raman, 1940	4,500	92	4		5,882	40,601,289	18.7
	Bati Raman, 1961	4,200	93	6		2,382	30,362,483	13.3
	Garzan Germik, 1968	4,700-6,500	22	1		1,138	33,722,058	18.8-26.2
	Magrip, 1961	5,700	12	2		363	13,931,326	18.4
	Silivanka, 1962	8,200	9			768	6,265,094	23.0
	Adiyaman, 1971	5,800	13	1		737	7,121,044	26.7

*Began production in May 1983
Includes Soldado, N. Soldado, E. Soldado, and S.W. Soldado.

PRODUCTION BY FIELDS

WORLDWIDE PRODUCTION	Name of field, discovery date	Depth, feet	No. of wells			B'd average first 6 mo. 1983	Cumulative bbl to July 1, 1983	*API gravity
			Flow	Artificial lift	Shut-in			
ERSAN(e)	Güney Sarıca, 1973	5,250	5	—	—	331	3,131,781	31.5
	Yeniköy, 1973	6,400	8	—	—	1,062	6,600,042	31.4
	Güney Sahabani, 1978	5,450	5	—	—	434	1,149,318	33.2
	Güney Dincer, 1981	5,350	22	1	—	3,016	2,095,688	16.7
	Kartaltepe, 1982	6,550	3	—	—	521	126,328	32.0
	Other	—	18	—	2	1,515	8,574,513	—
	Kahta, 1958	3,500	1	—	—	87	4,108,531	11.5
	Total Turkey	—	427	60	—	43,226	404,644,313	—
UNITED KINGDOM	AMOCO • Montrose, 1969	8,200	10	6	—	14,780	52,787,000	40.5
	• NW Hutton, 1975	12,000	5	—	—	25,860	4,681,000	36.0
	BGC Wytch Farm, Bridgeport Sands, 1974	2,909	—	8	5	3,114	3,724,973	37.0
	Wytch Farm, Sherwood Sandstone, 1977	5,115	1	—	5	1,313	1,082,132	41.0
	BRITOL • Thistle, 1973	9,000	31	—	1	104,856	195,337,721	38.0
	• Beatrice, 1976	6,750	—	13	—	29,129	19,675,818	39.0
	BP • Forties, 1970	7,000	40	—	—	451,928	1,189,452,416	37.0
	• Buchan, 1974	8,692	9	—	—	38,000	24,167,777	33.0
	East Midlands, 1939, and Dorset	3,500	NA	NA	NA	1,641	25,329,000	40.0
	CHEVRON • Ninian, 1974	10,000	51	—	15	293,000	409,745,000	35.0
	CONOCO GROUP • Statfjord, 1974	7,000	20	—	—	59,864	60,493,000	39.0
	• Murchison, 1975	9,900	13	—	2	90,880	76,612,000	NA
	HAMILTON BROS. • Argyll, 1971	9,000-9,400	7	—	—	17,100	48,086,000	38.0
	MOBIL • Beryl, 1972	9,900-11,500	17	8	4	81,412	203,739,659	37.4
	OCCIDENTAL • Claymore, 1974	8,100	—	18	5	86,950	168,350,000	29.5
	• Piper, 1973	8,100	18	1	4	200,320	517,096,000	37.2
	SHELLESCO • Auk, 1970	NA	10	—	—	11,792	58,977,952	37.0
	• Brent, 1971	NA	45	—	2	369,413	418,153,253	38.0
	• Cormorant, 1972	NA	7	—	—	27,051	25,668,231	36.0
	• Cormorant N., 1974	NA	NA	—	15	42,074	16,928,394	35.0
	• Dunlin, 1973	NA	19	—	4	81,580	127,715,313	33.0
	• Fulmar, 1975	NA	6	—	1	110,617	39,086,677	41.0
	TEXACO • Tartan, 1974	10,217-12,614	6	—	2	26,300	13,400,000	37.0-39.8
	UNION OIL • Heather, 1973	10,800	5	13	11	27,546	39,232,481	36.0
	Total United Kingdom	—	320	67	76	2,196,520	3,739,523,797	—

*Production began in April 1983. †U.K.'s 15.91% share of production from unitized field only. ‡U.K.'s 83.75% share of production from unitized field only.

U.S.S.R.

Field, year discovered	No. wells	1983 prod. (million bbl)	Cum prod. 1-1-84 (million bbl)	Pay, ft
Arlan, 1955	3,000	57	2,237	Carb., 4,429
Baku Archipelago, 1963	200	21	391	Pliocene, 8,773
Fedorovskoye, 1971	1,300	266	1,341	L. Cret., 5,900
Kholmogorskoye, 1973	500	60	222	L. Cretaceous
Kotur-Tepe, 1956	350	30	1,073	Pliocene, 8,793
Mamontovo, 1965	1,300	210	1,394	Cretaceous, 6,300
Neftyanie Kamini, 1949	1,200	21	1,043	Pliocene, 5,406
Pravdinsk, 1964	500	58	718	L. Cret., 9,580

Field, year discovered	No. wells	1983 prod. (million bbl)	Cum prod. 1-1-84 (million bbl)	Pay, ft
Romashkino, 1948	8,000	360	12,740	Devonian, 5,791
Samotlor, 1965	4,400	1,100	10,035	L. Cret., 7,316
Sovetskoye, 1962	300	48	748	Cret., 11,130
Usa, 1963	900	115	635	Paleozoic, 6,510
Ust-Balyk, 1961	1,000	80	1,362	L. Cret., 8,845
Uzen, 1961	2,000	65	1,350	Jurassic, 2,667
Yuzhno-Surgut, 1973	500	78	378	L. Cret.
Zapadno-Surgut, 1962	250	28	478	Cret., 7,628

VENEZUELA

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PRODUCTION BY FIELDS

WORLDWIDE PRODUCTION	Name of field, discovery date	Depth, feet	Flow	No. of wells		B/d average first 6 mo. 1983	Cumulative bbl to July 1, 1983	%API gravity
				Artificial lift	Shut-in			
	Yopales, 1937	4,600	28	134	107	17,785	140,470,154	22.2
	Zanjas, 1958	13,270	10		7	3,013	33,008,141	35.4
	Zapatas, 1955	11,500	26	7	39	7,415	137,884,549	37.0
	Zorro, 1953	11,100	4	6	17	2,480	67,965,686	28.3
	Zulus, 1957	12,710	8	3	15	1,812	21,732,636	39.8
	Zumo, 1954	9,200			49	910	66,786,417	17.9
	La Ceibita, 1963	9,878	22		11	3,664	75,949,373	41.3
	Adjuntas, 1957	5,000			55	1,327	10,471,127	13.9
	Other		107	182	445	38,743	1,019,234,623	
MONAGAS	Acema, 1960	NA	34	2	89	9,423	27,271,774	23.9
	Aguasay, 1955	8,100-13,400	20		28	5,074	76,410,138	41.7
	Jobo, 1956	3,600-4,000		202	221	43,473	202,692,403	12.0
	Monichal, 1958	3,312		70	130	10,542	160,873,340	10.6
	Orocual, 1953	2,954	6	4	26	2,055	23,309,810	27.0
	Oritupano, 1950	7,657	6	25	112	8,091	167,331,801	22.8
	Pintal, 1958	450-1,100		62	20	2,121	25,386,721	17.0
	Quiriquire, 1928	7,000-7,200		230	243	7,100	755,178,151	16.3
	Sta. Barbara, 1941	5,020-6,500	10	44	244	1,698	165,257,608	29.8
	Tacat, 1953	1,820-3,670		50	84	1,691	42,422,839	17.0
	Temblador, 1936	3,500-4,500		20	34	2,568	107,247,285	19.2
	Other		5	111	391	34,316	674,251,685	
ZULIA	Boscan, 1946	NA		253	176	63,980	657,497,538	10.2
	Bachaquero, 1930	NA	70	1,790	1,705	318,741	5,958,530,719	20.2
	Cruces-Manueles, 1916	3,000-8,000	1		130	861	173,116,304	30.9
	Cabimas, 1917	2,200	8	1,003	537	56,118	1,511,760,034	23.4
	Centro, 1959	9,600-11,000	21	54	105	87,379	680,737,343	35.6
	La Concepcion, 1953	3,148-8,000	2	59	104	3,492	130,122,753	35.1
	La Paz, 1925	4,268-8,000	9	51	93	17,341	834,423,215	30.5
	Lago, 1959	11,450	21		43	17,451	205,641,319	31.7
	Lagunillas, 1926	3,000	368	2,212	2,728	398,404	10,119,233,765	21.5
	Lama, 1937	8,320	72	32	235	108,403	2,334,837,274	32.8
	Lamar, 1958	13,000	56	51	118	68,468	1,006,100,967	34.5
	Mara, 1945	5,240	6	28	70	6,796	1,409,161,427	22.0
	Mene Grande, 1914	4,130	1	307	276	13,105	621,855,474	18.4
	Motatan, 1952				19	4,603	43,496,445	20.3
	Sibucana, 1948	13,450		1	2	525	42,481,599	32.2
BARINAS	Tia Juana, 1928	3,000	17	2,044	738	216,774	3,624,761,604	17.9
	Urdaneta, 1970	10,000	9	35	74	26,066	62,331,654	23.3
	West-Tarra, 1942	4,250-5,500	4		41	1,444	68,648,758	41.3
	Other			12	156	42,575	609,183,061	
BARINAS	Hato, 1965	9,550	1	14	1	2,974	39,199,424	27.3
	Maporal, 1957	10,950		6	1	1,011	10,507,193	28.9
	Paez, 1963	NA	1	44	9	12,810	45,214,007	20.2
	Silvan, 1949	10,860	1	12	1	2,707	43,157,054	29.3
	Silvestre, 1948	8,860	34	12	6,720	129,416,497	25.3	
	Sinco, 1953	8,500-9,100	2	48	31	9,530	241,784,617	24.0
	Other		2	2	5	537	3,265,940	
FALCON	All fields			12	148	282	107,748,092	
GUARICO	Budare, 1958	4,523	8	15	13	5,277	62,732,981	31.5
	Las Mercedes, 1942	4,500	2	28	154	850	135,658,746	28.8
	Ruiz, 1949	4,500		8	34	420	32,814,226	32.0
	Other		6	52	209	14,167	368,104,664	
AMACURO	Tucupita	NA	28	2	37	2,459	65,662,260	16.6
Total Venezuela			1,482	10,122	12,416	1,873,360	39,672,390,626	

WEST GERMANY*

BAVARIA	Arlesried, 1964	4,900				712	11,947,384	47.0	
	Moenchsrodt, 1958	4,800		112		378	11,024,931	36.0	
	Other					3,830	30,579,054		
EMS LAND	Emlichheim, 1964	2,600				2,922	38,819,812	25.0	
	Georgsdorf, 1944	1,800-2,600				7,292	91,240,633	24.0-29.0	
	Meppen-Schwefingen, 1960	4,000		1,119		1,036	10,643,105	28.0-30.0	
	Ruehlhorn, 1949	2,000-4,700				11,311	123,932,499	28.0-30.0	
	Ruehlertwist, 1949	2,350-2,900				2,077	28,486,863	25.0	
	Scheerhorn, 1949	3,550-3,750				2,864	45,843,766	30.0	
	Other					1,560	28,364,442		
SCHLESWIG-HOLSTEIN	Ploen-Ost, 1959	6,400				1,793	46,714,423	36.0	
	Preetz, 1962	8,350-8,550		216		493	10,244,022	29.0	
	Reitbrook, 1937	1,450-2,100				1,592	36,440,733	29.0	
	Other					2,363	49,427,345		
	Eldingen, 1949	4,750				910	17,934,026	35.0	
HANOVER	Hankensbuttel, 1954	4,450-5,100				5,609	85,828,946	33.0	
	Hardesse, 1958	4,300-5,900				874	8,269,225	34.0	
	Hohne, 1958	4,300-5,900				996	37,549,669	33.0-34.0	
	Knesebeck, 1958	5,100-5,200				1,500	16,211,577	36.0	
	Leiferde, 1956	2,600		852		561	19,360,485	34.0	
	Lueben, 1955	3,950				1,021	10,334,759	35.0-38.0	
	Meckelfeld, 1938	1,000-1,300				392	13,557,186	24.0-32.0	
	Oelheim-Sued, 1958	7,650				615	6,184,424	33.0	
	Orrel-Wesendorf-Nord, 1954	4,450				1,065	11,142,316		
	Ruenne, 1954	1,950				1,010	8,604,802		

PRODUCTION BY FIELDS

WORLDWIDE PRODUCTION	Name of field, discovery date	Depth, feet	No. of wells			B'd average first 6 mo. 1983	Cumulative bbl to July 1, 1983	*API gravity
			Flow	Artificial lift	Shut-in			
UPPER RHINE VALLEY	Sinstorf, 1960	6,750-7,150				830	17,424,116	
	Suderbruch, 1949	3,750-7,550				615	21,794,554	19.0-38.0
	Vorhop, 1952	2,950-6,900				1,096	14,922,820	36.0
	Other					3,263	219,163,234	
	Landau, 1955	3,950-4,800				1,368	23,125,760	36.0
	Other			119		330	11,823,139	
	WESER-EMS					2,655	32,722,760	29.0
	Barenburg, 1953	2,300-3,300				1,284	18,464,115	
	Bolkstedt, 1954	3,750				6,754	85,470,939	29.0
	Bramberge, 1958	2,560-3,300				1,806	38,459,664	
WESER-EMS	Dueste, 1954	2,600-4,250				1,515	19,783,862	
	Gross Lessen, 1969	3,300		724		1,379	36,885,084	
	Sued-Oldenburg, 1950	1,700-6,500				899	22,973,867	31.0-34.0
	Vogtei, 1953	1,150-1,500				819	14,561,137	33.0
	Wehrbleck, 1947	3,400				1,917	28,995,123	
	Other							
	Other							
Total West Germany			3,142			81,306	1,405,258,601	

*Total wells as of Dec. 31, 1982

ZAIRE	GULF OIL	● GCO, 1970	7,000- 9,000	5	8	800	5,361,000	29.0
		● Mibale, 1973	5,000- 6,000	7	1	20,400	51,581,000	30.0
		● Mwambe, 1979	6,150	1	1	100	367,000	30.4
		● Motoba, 1976	11,098	1		20	109,000	44.3
	Total Zaire			6	8	10	21,320	57,418,000

UNITED STATES

State	Field	Disc. date	1,000 bbl		Est. No. wells	
			1983 prod.	Cum. prod. 1-1-84		Est. rem. reserves
ALABAMA						
	Citronelle, 1955		1,984	137,083	16,727	446
ALASKA*						
	Granite Point, 1965 ..		3,520	94,513	24,243	30
	Kuparuk, 1971		38,849	72,353	1,161,400**	83
	McArthur River, 1965		13,664	487,312	63,000	66
	Middle Ground Shoal, 1963		3,377	140,714	17,894	39
	Prudhoe Bay***, 1968		562,027	3,227,176	6,232,000	369
	Swanson River, 1968.		3,046	198,568	16,000	44

*Some production and reserves data provided by Alaska Oil & Gas Conservation Commission, including corrections of OGJ estimates last year.
OGJ estimate. Other estimates for reserves in Kuparuk River pool alone range from 500-750 million bbl of oil. *Includes about 14.5 million bbl of condensate.

ARKANSAS					
Smackover, 1922	3,848	539,268	18,000	2,160	

CALIFORNIA*					
SAN JOAQUIN VALLEY					
Belridge South, 1911	43,000	387,375	363,900	4,207	
Buena Vista, 1909	2,024	640,673	18,800	1,157	
Coalinga, 1890	9,674	701,473	83,600	2,100	
Coalinga Nose, 1938	1,735	491,302	16,202	76	
Coles Levee North, 1938	914	157,752	9,003	97	
Cuyama, 1949	629	215,432	1,414	134	
Cymric, 1909	4,968	165,510	38,300	853	
Edison, 1928	1,454	126,902	36,460	789	
Elk Hills, 1911	56,242	677,818	795,200	1,196	
Fruitvale, 1928	1,034	111,019	9,700	412	
Greeley, 1936	170	111,299	1,315	36	
Kern Front, 1912	2,489	162,121	25,000	1,019	
Kern River, 1899	48,078	966,446	983,100	5,655	
Kettleman North Dome, 1928	228	455,375	1,277	61	
Lost Hills, 1910	5,901	152,515	85,100	1,599	
McKittrick, 1896	4,662	249,432	29,700	1,245	
Midway-Sunset, 1894	47,514	1,601,327	489,400	8,554	
Mount Poso, 1926	7,628	227,175	67,700	525	
Rio Bravo, 1937	413	115,078	489	20	

COASTAL AREA					
Cat Canyon E. & W., 1908	5,110	269,281	65,720	820	

State	Field	Disc. date	1,000 bbl		Est. No. wells
			1983 prod.	Cum. prod. 1-1-84	
LOS ANGELES BASIN	Dos Cuadras, 1969	6,352	186,811	67,350	137
	Elwood, 1928	146	104,044	870	7
	Hondo, 1969	12,998	34,316		19
	Orcutt, 1901	1,167	160,751	15,361	183
	Rincon, 1927	1,570	141,523	10,963	276
	San Ardo, 1947	8,110	375,753	153,980	750
	Santa Maria Valley, 1934	3,035	187,243	51,254	198
	South Mountain, 1916	987	141,851	16,180	384
	Ventura, 1919	6,920	857,756	133,290	605
	Point Arguello,***, 1981				
	Coal Oil Point (South Elwood ext.), 1982	(see above)			
	Beta, 1976	3,812	8,278		32
	Beverly Hills, 1900	3,557	109,982	24,313	127
	Brea Olinda, 1880	2,678	371,970	68,020	734
	Coyote East, 1909	665	105,497	4,872	122
	Coyote West, 1909	1,068	245,333	5,704	137
	Dominguez, 1923	717	265,958	6,859	107
LOS ANGELES BASIN	Huntington Beach, 1920	9,210	1,030,313	88,627	959
	Inglewood, 1924	3,567	329,323	64,316	412
	Long Beach, 1921	3,367	895,829	30,681	492
	Montebello, 1917	465	189,564	3,465	144
	Richfield, 1919	1,633	180,414	11,098	226
	Santa Fe Springs, 1919	952	607,952	10,720	161
	Seal Beach, 1924	1,038	197,138	6,241	166
	Torrance, 1922	2,502	203,168	11,052	371
	Wilmington, 1932	38,436	2,110,909	393,250	2,187
	Other				

*Some production and reserves data supplied by California Division of Oil & Gas, including corrections of OGJ estimates last year.
**Hondo reserves identified thus far are pegged at about 94 million bbl of oil, but western portion of field and the other two fields in the Santa Ynez unit, Sacate and Pescado, are yet to be developed. Combined potential reserves of the unit are estimated at about 400 million bbl of oil.
***Scheduled to begin production by 1986. Three platforms on tap so far, to develop reserves conservatively estimated at 300-500 million bbl of oil.
****At least 196 million bbl of oil reserves have been identified thus far in Beta field. Further development planned, with ultimate recovery pegged at as much as 300 million bbl of oil.

COLORADO*					
Rangeley, 1933	13,799	677,737	45,541	508	

PRODUCTION BY FIELDS

State	Field	Disc. date	1983 prod.	1,000 bbl Cum. prod. 1-1-84	Est. rem. reserves	Est. No. wells
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FLORIDA

Jay, 1970	12,909	327,235	85,700	112
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ILLINOIS*

Clay City, 1938	2,993	336,241	9,000	2,600
Lawrence, 1906	2,320	379,188	6,000	2,725
Louden, 1938	1,779	380,360	4,621	1,335
Main, 1906	1,628	223,628	3,000	3,395
New Harmony, 1939	2,095	149,027	2,000	1,150
Salem, 1938	227	374,933	3,700	1,300

KANSAS*

Bernis-Shotts, 1928	1,600	232,196	3,600	898
Chase-Silica, 1931	1,343	260,553	4,455	1,055
Eldorado, 1917	1,433	290,086	4,000	830
Hall-Gurney, 1931	1,212	139,463	4,259	1,108
Trapp, 1937	1,446	219,886	3,568	954

LOUISIANA

Onshore South				
Bay de Chene, 1941	804	94,409	20,350	45
Bay St. Elaine, 1928	612	162,923	27,177	51
Bayou Sale, 1941	672	157,081	7,603	18
Black Bay, West, 1953	3,288	133,834	20,685	86
Caillou Island, 1930	3,876	587,858	87,344	193
Cote Blanche Bay, West, 1940	1,068	178,065	49,912	160
Delta Farms, 1944	336	114,112	8,261	23
Garden Island Bay, 1934	2,316	212,911	40,408	165
Golden Meadow, 1938	984	130,677	8,564	221
Grand Bay, 1938	816	167,204	7,070	73
East Hackberry, 1927	780	103,850	12,668	60
West Hackberry, 1928	1,584	131,860	16,527	124
Iowa, 1931	96	95,378	960	24
Jennings, 1901	372	114,454	2,383	146
Lafitte, 1935	2,172	245,896	18,928	177
Lake Barre, 1929	1,872	199,028	25,284	65
Lake Pelto, 1929	624	114,205	20,239	40
Lake Washington, 1931	2,664	230,057	28,744	100
Leeville, 1931	660	138,634	10,325	49
Paradis, 1939	540	121,700	12,978	34
Quarantine Bay, 1937	1,500	167,841	6,443	65
Timbalier Bay, Onshore, 1938	2,292	267,325	28,814	114
Venice, 1937	1,152	177,337	12,132	62
Vinton, 1910	600	134,010	2,155	116
Weeks Island, 1945	936	220,961	26,390	47
West Bay, 1940	2,580	219,265	25,336	127

North

Caddo-Pine Island, 1905	4,260	341,571	20,000	9,217
Delhi, 1944	2,172	206,275	40,083	116
Haynesville, 1921	1,860	162,832	3,296	302
Homer, 1919	396	96,283	4,000	117
Rodessa, 1935	960	104,533	3,000	65

Offshore

Bay Marchand Blk. 2, 1949	2,292	169,633	90,000	89
Bay Marchand Blk. 2, 1949	7,987	564,403	86,197	132
Eugene Island Blk. 330, 1971	11,467	219,315	105,685	181
Grande Isle Blk. 16, 1948	265	3,381	99,409	42
Grand Isle Blk. 43, 1956	7,329	242,873	114,827	1630
Main Pass Blk. 41, 1957	205	190,107	90,097	110
Main Pass Blk. 69, 1969	3,060	222,882	35,000	123
Main Pass Blk. 306, 1969	2,617	67,622	82,378	111
Mississippi Canyon Blk. 194, 1980	25,394	43,495	125,000	39
Ship Shoal Blk. 204, 1968	294	57,004	47,996	39
Ship Shoal Blk. 207, 1967	821	79,150	47,589	47
Ship Shoal Blk. 208, 1952	3,561	138,811	86,632	33
South Pass Blk. 24, 1950	5,616	444,940	41,604	391
South Pass Blk. 27, 1954	2,340	113,736	84,779	260

State	Field	Disc. date	1983 prod.	1,000 bbl Cum. prod. 1-1-84	Est. rem. reserves	Est. No. wells
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South Pass Blk. 61, 1968	10,436	99,068	75,932	138
South Pass Blk. 62, 1965	3,805	91,400	96,559	66
South Pass Blk. 65, 1969	2,456	86,735	103,392	47
South Timbalier Blk. 21, 1939	2,690	201,093	61,550	61
South Timbalier Blk. 135, 1956	1,100	133,026	31,974	36
West Delta Blk. 30, 1949	8,087	402,841	48,260	149
West Delta Blk. 73, 1962	3,737	171,985	103,005	74

MICHIGAN

Pigeon River, 1970				
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MISSISSIPPI

Baxterville, 1944	5,222	219,547	20,000	298
Heidelberg, 1944	3,810	153,265	18,335	294
Tinsley, 1939	1,439	214,212	6,000	186

MONTANA*

Bell Creek, 1967	2,750	122,223	30,250	207
Cut Bank, 1926	1,164	157,214	42,276	703
Pine, 1951	1,876	97,498	13,224	97

NEW MEXICO

Denton, 1949	888	135,104	4,898	130
Empire Abo, 1957	2,904	210,188	59,812	190
Eunice-Monument, 1929	3,540	160,308	20,000	1,000
Hobbs, 1928	5,280	260,710	29,000	410
Maljamar, 1926	2,424	135,003	15,028	760
Vacuum, 1929	18,744	358,588	45,000	1,090

NORTH DAKOTA*

Beaver Lodge, 1951	2,380	103,045	17,550	155
Billings Nose, Four Eyes, 1978	295	4,067		14
Big Stik, 1979	4,544	24,568	66,124	57
Little Knife, 1977	5,546	30,537	72,554	149
Mondak, 1976	1,185	10,058	88,595	181
T-R, 1978	2,006	8,388		64

OKLAHOMA*

Burbank, 1920	2,201	526,854	15,551	1,057
Eola-Robberson, 1947	1,377	127,062	12,939	594
Fitts, 1933	3,318	178,476	9,766	597
Glenn Pool, 1905	1,223	322,488	7,512	1,121
Golden Trend, 1945	3,721	434,378	29,650	1,245
Healdton, 1913	2,087	331,284	18,609	1,425
Hewitt, 1919	2,627	259,979	26,240	1,276
Oklahoma City, 1928	763	740,376	8,393	204
Postle, 1960	1,665	98,246	21,587	316
Sho-Vel-Tum, 1914	19,575	NA	105,423	8,571
Sooner Trend, 1965	7,288	259,630	35,469	5,320

TEXAS

District 2				
Greta, 1933	1,260	142,700	17,400	146
Lake Pasture, 1953	2,640	71,504	23,924	164
Tom O'Connor, 1934	19,164	677,744	123,256	763
West Ranch, 1938	5,040	363,984	20,000	372

District 3				
Anahuac, 1935	2,412	277,260	22,740	141
Conroe, 1931	10,992	698,995	60,000	379
Giddings, 1971	37,656	193,656	231,344	2,211
Hastings, 1934	7,080	676,080	93,920	325
Magnet Withers, 1936	2,508	101,180	10,000	181
Oyster Bayou, 1941	1,716	154,852	23,448	48
Thompson, 1931	6,612	450,796	49,104	277
Tomball, 1933	912	118,312	11,688	122
Webster, 1937	5,916	545,592	16,084	150

District 5				
Van, 1928	4,032	503,708	46,492	451

District 6				
East Texas, 1930	52,752	9,632,265	1,214,936	11,249
Fairway, 1960	4,572	177,156	33,044	99
Hawkins, 1940	12,480	765,252	92,520	443
Neches, 1953	3,000	94,388	15,512	139
Quitman, 1948	2,568	111,728	5,000	225



State	Field	Disc. date	1983 prod.	1,000 bbl Cum. prod. 1-1-84	Est. rem. reserves	Est. No. wells
District 8						
	Andector, 1946		3,516	168,544	17,000	71
	Block 31, 1945		6,072	198,236	22,864	254
	Cowden, N., 1930		16,140	417,652	45,000	1,237
	Cowden, S., Foster, Johnson, 1932		14,568	449,928	35,172	1,626
	Dollarhide, 1945		2,748	181,708	18,792	158
	Dune, 1938		4,368	166,932	16,000	928
	Fullerton, 1942		7,992	311,312	35,000	734
	Goldsmith, 1934		11,220	714,520	68,780	2,336
	Howard Glasscock, 1925		9,768	375,840	40,000	2,298
	Iatan, E., 1926		4,584	125,352	20,000	1,168
	Jordan, 1937		1,716	123,660	7,540	330
	Keystone, 1930		3,024	302,460	20,000	839
	McElroy, 1926		11,040	424,281	87,960	2,065
	Means, 1934		4,692	196,210	26,940	500
	Midland Farms, 1944		4,728	218,976	25,000	343
	Sand Hills, 1931		8,059	231,811	38,000	1,485
	TXL, 1944		1,536	254,888	9,792	638
	Waddell, 1927		1,404	96,680	8,320	209
	Ward Estes, N., 1927		4,092	344,284	20,716	1,372
	Yates, 1926		46,512	967,206	987,299	697
District 8-A						
	Anton-Irish, 1944		7,584	153,876	46,224	239
	Cogdell Area, 1949		3,000	258,000	51,232	136
	Diamond M., 1948		3,048	227,838	28,500	451
	Kelly-Snyder, 1948		27,876	1,155,806	194,194	919
	Levelland, 1938		22,236	396,472	60,000	2,560
	Prentice, 1951		4,620	135,512	24,088	350
	Salt Creek, 1950		8,580	208,772	51,120	140
	Seminole, 1936		18,276	447,472	71,724	452
	Slaughter, 1936		28,452	919,664	80,236	2,876
	Spraberry Trend, 1951		27,792	545,724	47,208	6,094
	Wasson, 1936		50,616	1,548,830	124,384	2,123
	Weich, 1942		4,200	126,620	21,380	502
District 10						
	Panhandle, 1921		13,464	1,377,722	66,804	11,491

State	Field	Disc. date	1983 prod.	1,000 bbl Cum. prod. 1-1-84	Est. rem. reserves	Est. No. wells
UTAH*						
	Altamont-Bluebell, 1955		3,153	67,771	249,947	180
	Greater Aneth, 1956		6,060	324,892	43,940	463
	Greater Red Wash., 1951		1,134	116,355	20,966	222
	East Anschutz Ranch, 1979		6,381	7,098	793,619	7
	Pineview, 1975		1,339	23,204	122,261	727

WYOMING*

State	Field	Disc. date	1983 prod.	1,000 bbl Cum. prod. 1-1-84	Est. rem. reserves	Est. No. wells
	Brady, 1960		3,571	39,364	64,329	9
	Byrrol, 1918		2,124	112,369	15,826	50
	Elk Basin (Wyo-Mont), 1915		3,799	430,955	41,601	190
	Garland, 1906		2,839	148,390	8,000	244
	Grass Creek, 1914		2,842	172,735	20,858	280
	Hamilton Dome, 1918		3,357	252,650	10,443	265
	Hartzog Draw, 1976		2,757	37,954	311,743	138
	Hilgert, 1969		1,023	72,214	59,077	124
	Lance Creek, 1918		191	107,357	409	46
	Lost Soldier, 1916		3,340	178,520	14,460	82
	Oregon Basin, 1912		9,895	342,544	62,005	465
	Painter Reservoir, 1979		6,326	20,064	105,174	47
	Salt Creek, 1906		5,909	614,680	25,000	1,066
	Whitney Canyon- Carter Creek, 1980		1,635	1,761	113,365	5

*Production data furnished by Petroleum Information. Denver. Reserve data by Oil & Gas Journal.



International Active Rig Count

Region	1976	1977	1978	1979	1980	Land	1981 Off.	Total	Land	1982 Off.	Total	Land	1983 Off.	Total
NORTH AMERICA														
Canada	179	218	272	339	401	259	5	264	195	5	200	190	11	201
United States	1,656	2,001	2,255	2,176	2,910	3,715	255	3,970	2,861	244	3,105	2,030	199	2,229
Subtotal	1,835	2,219	2,527	2,515	3,312	3,973	260	4,233	3,056	249	3,305	2,220	210	2,430
LATIN AMERICA														
Argentina	65	68	72	63	76	67	3	70	65	2	67	72	1	73
Barbados	0	0	0	0	0	1	0	1	1	0	1	1	0	1
Bolivia	8	6	6	6	4	11	0	11	11	0	11	8	0	8
Brazil	44	45	52	60	72	52	30	82	63	31	94	54	29	93
Chile	5	5	5	6	7	3	4	7	4	3	7	3	3	6
Colombia	7	11	11	15	14	22	0	22	22	1	23	18	1	19
Costa Rica	0	0	0	0	0	0	0	0	6	0	6	1	0	1
Dominican Republic	0	0	0	0	0	1	0	1	1	0	1	0	0	0
Ecuador	1	1	1	3	3	4	0	4	5	1	6	5	1	6
Guatemala	3	3	1	1	4	7	0	7	5	0	5	1	0	1
Mexico	138	148	167	205	215	198	20	218	180	22	202	160	27	187
Paraguay	0	1	1	0	0	1	0	1	1	0	1	0	0	0
Peru	15	13	16	20	21	19	5	24	18	6	24	10	5	15
Trinidad	17	15	17	14	13	8	6	14	8	6	14	6	4	10
Uruguay	0	0	0	0	0	0	0	0	1	0	1	0	0	0
Venezuela	16	20	33	47	52	46	17	63	52	18	70	29	12	41
Subtotal	318	335	380	440	480	436	85	521	434	87	521	368	82	450
FAR EAST														
Bangladesh	4	2	3	2	3	5	0	5	5	0	5	2	0	2
Brunei	5	7	8	8	8	1	6	7	3	7	10	3	7	10
Burma	18	17	18	22	26	30	0	30	32	1	33	35	1	36
China-offshore	0	0	0	8	12	—	9	9	—	10	10	—	10	10
India	41	43	40	40	43	37	7	44	41	10	51	41	14	55
Indonesia	51	46	62	66	77	60	27	87	60	32	92	62	25	87
Japan	14	14	13	15	16	14	2	16	18	4	22	18	2	20
Korea	0	1	1	0	0	0	0	0	0	0	0	1	0	1
Malaysia	4	8	11	13	12	0	12	12	0	13	13	0	10	10
North Korea	0	0	0	1	1	0	0	0	0	0	0	0	0	0
Pakistan	8	5	8	13	14	15	0	15	17	0	17	17	0	17
Philippines	6	6	6	15	12	10	3	13	12	3	15	7	1	8
Sri Lanka	0	0	0	0	0	0	1	1	0	0	0	0	0	0
Taiwan	10	11	9	10	12	10	1	11	4	1	5	7	1	8
Thailand	4	1	2	2	5	3	4	7	3	5	8	6	6	12
Viet Nam	0	0	0	2	1	0	0	0	0	0	0	0	0	0
Subtotal	164	159	179	217	240	184	74	258	193	84	277	196	67	263

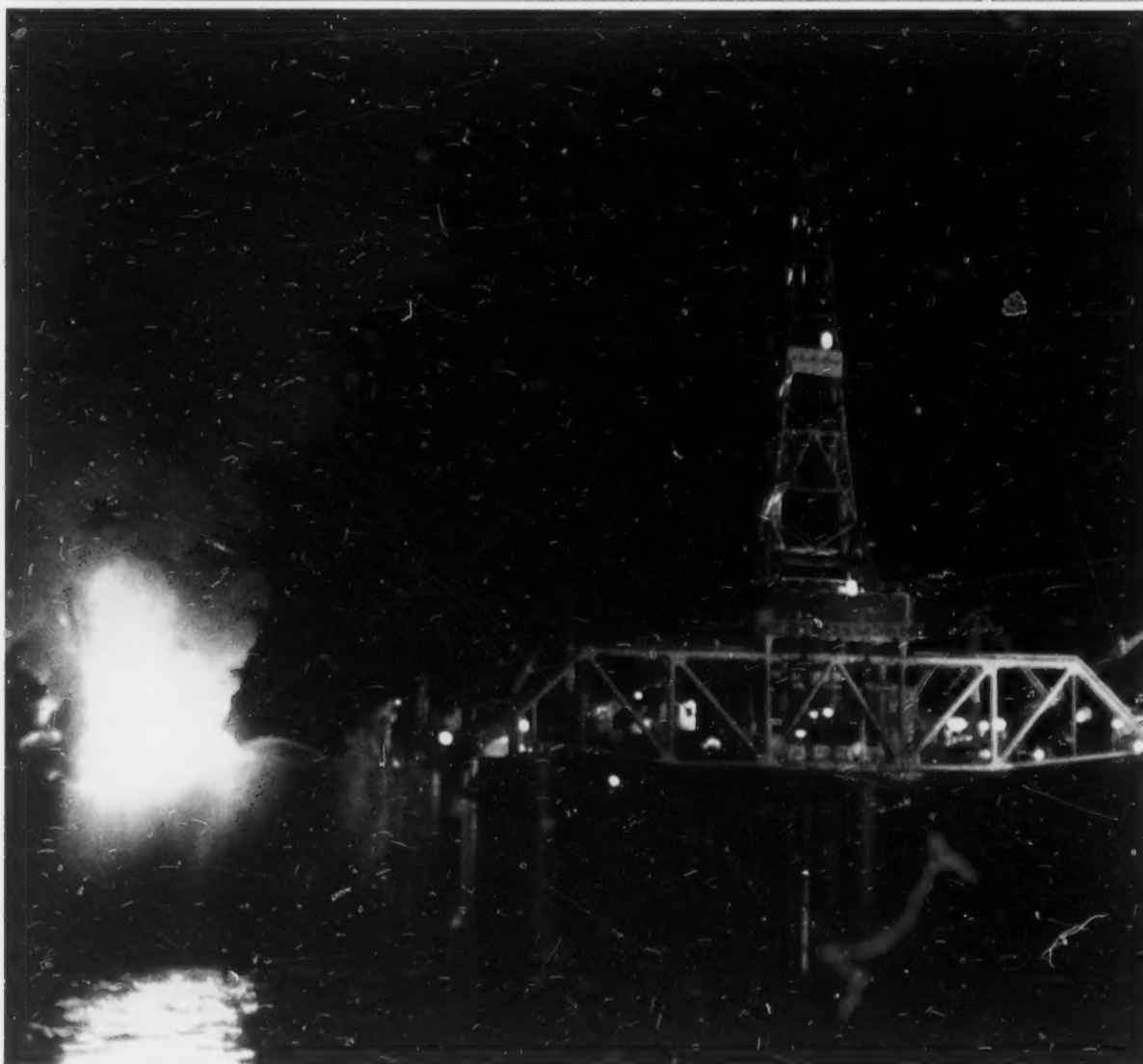
international Active Rig Count (continued)

Region	1976	1977	1978	1979	1980	Land	1981 Off.	Total	Land	1982 Off.	Total	Land	1983 Off.	Total
AFRICA														
Algeria	83	108	101	109	111	91	0	91	81	0	81	53	0	53
Angola	0	1	2	6	5	2	5	7	3	8	11	3	9	12
Benin	0	0	0	0	0	0	0	0	0	1	2	0	1	1
Cameroon	2	2	2	4	6	0	7	7	1	6	7	1	5	6
Chad	0	1	1	1	1	1	0	1	1	0	1	1	0	1
Congo	2	2	1	1	4	2	5	7	2	5	7	1	5	6
Gabon	5	6	4	6	8	4	10	14	3	9	12	1	7	8
Ghana	0	1	1	0	0	0	0	0	0	0	0	0	0	0
Guinea Republic	0	0	0	0	0	0	0	0	0	1	1	0	1	1
Ivory Coast	1	1	2	3	3	0	5	5	0	5	5	0	2	2
Kote	0	0	1	0	0	0	0	0	0	0	0	0	0	0
Libya	19	23	28	33	41	31	2	33	29	2	31	22	2	24
Morocco	3	4	4	3	2	4	1	5	5	1	6	6	0	6
Niger	2	3	4	5	5	5	0	5	3	0	3	1	0	1
Nigeria	15	16	16	18	20	16	6	22	16	11	27	9	8	17
Senegal	0	0	0	0	0	0	0	0	1	0	1	1	0	1
Sierra Leone	0	0	0	0	0	0	0	0	0	1	1	0	1	1
South Africa	1	2	2	2	2	0	2	2	0	2	2	0	2	2
Sudan	0	0	1	2	2	3	0	3	2	0	2	4	1	5
Tanzania	0	0	0	0	0	0	0	0	0	0	0	1	0	1
Tunisia	5	4	6	7	8	8	3	11	8	3	11	5	2	7
Zaire	1	1	0	1	1	1	1	2	1	1	2	1	1	2
Subtotal	138	173	175	200	219	167	45	212	155	54	209	107	43	150
EUROPE														
Austria	9	10	9	10	8	9	0	9	9	0	9	9	0	9
Belgium	0	0	0	0	1	0	0	0	0	0	0	0	0	0
Denmark	3	0	0	0	3	2	2	4	0	2	2	1	4	5
France	13	7	8	11	13	19	2	21	21	2	23	16	1	17
Germany	22	21	22	21	22	25	1	26	31	0	31	25	0	25
Greece	0	0	2	2	3	3	3	6	2	2	4	2	1	3
Holland	18	18	14	17	17	9	7	16	8	12	20	6	10	16
Ireland	1	2	3	2	1	0	0	0	1	1	2	0	2	2
Italy	11	12	18	21	19	24	7	31	31	7	38	19	7	26
Norway	9	5	5	7	11	0	12	12	0	13	13	0	10	10
Portugal	1	0	0	0	0	1	0	1	1	0	1	1	0	1
Spain	7	6	6	5	10	8	3	11	7	5	12	4	3	7
Switzerland	0	0	0	0	1	1	0	1	1	0	1	1	0	1
United Kingdom	36	36	34	34	48	5	53	58	2	55	57	2	40	42
Yugoslavia	13	24	23	22	22	22	0	22	24	0	24	20	2	22
Subtotal	143	140	142	152	178	126	90	216	137	98	235	107	77	184
MIDDLE EAST														
Abu Dhabi	14	15	16	20	23	13	17	30	18	23	41	12	23	35
Bahrain	2	0	2	1	1	1	0	1	1	0	1	1	1	2
Dubai	6	4	2	1	3	1	2	3	1	2	3	3	4	7
Egypt	22	20	16	21	26	10	16	26	14	22	36	16	19	35
Fujairah	0	1	0	0	0	0	0	0	0	0	0	0	0	0
Iran	56	56	53	8	—	—	—	—	9	2	11	12	2	14
Iraq	26	27	29	32	39	14	0	14	11	0	11	23	0	23
Jordan	0	0	0	0	0	0	0	0	0	0	0	3	0	3
Kuwait	1	1	2	2	3	3	0	3	4	0	4	4	1	5
Oman	4	6	6	7	8	10	0	10	11	2	13	10	2	12
Qatar	5	6	6	6	8	4	4	8	3	2	5	1	2	3
Ra's al Khaymah	1	2	1	0	1	1	0	1	1	1	2	1	1	2
Saudi Arabia	16	21	22	22	25	16	13	29	16	14	30	14	12	26
Sharjah	1	2	1	0	1	2	1	3	2	1	3	1	0	1
Syria	18	18	17	15	15	16	0	16	15	0	15	15	0	15
Turkey	17	16	17	9	24	26	0	26	34	0	34	26	0	26
Umm al Quwain	2	1	1	0	0	1	0	1	1	0	1	1	0	1
Subtotal	190	192	189	143	175	117	53	170	134	56	200	141	63	204
SOUTH PACIFIC														
Australia	6	7	10	11	15	18	5	23	24	9	33	15	10	25
Fiji	0	0	0	0	0	0	0	0	1	0	1	0	0	0
New Zealand	2	1	2	2	2	2	1	3	1	1	2	2	2	4
Popua New Guinea	0	0	0	0	1	1	0	1	1	0	1	1	1	2
Subtotal	8	8	12	13	18	20	6	26	26	9	35	17	11	28
Total	2,796	3,226	3,604	3,680	4,622	5,023	613	5,636	4,135	647	4,782	3,155	563	3,718

Source: Hughes Tool Company

Note: Columns may not add to totals due to independent rounding.

WELL COMPLETIONS



OCEAN DIGGER semi conducts production testing of BHP group's Big 1A Jabiru discovery in the Timor Sea.

World well completions—1982 AAPG, API data

Country	Total wells	Oil	Gas	Dry	Footage Meters	Total Wildcats	Oil	Gas	Dry	Footage Meters
South Pacific										
Israel	6	0	0	6	18,993	6	0	0	6	18,993
New Zealand	298	—	—	—	2,123,868	149	15	25	109	1,153,473
Australia	4	0	0	4	5,697	4	0	0	4	5,697
Fiji	2	0	0	2	7,433	2	0	0	2	7,433
Papua New Guinea										
Middle East										
Israel	22	0	9	13	38,660	14	0	1	13	38,736
Kuwait	8	6	0	2	26,960	8	6	0	2	26,960
Neutral Zone	6	4	0	2	—	2	0	0	2	14,330
Saudi Arabia	25	6	0	19	—	25	6	0	19	—
Bahrain	6	6	0	0	—	0	0	0	0	0
Qatar	52	12	0	40	—	4	0	0	4	—
Abu Dhabi	169	69	4	96	—	22	9	0	13	219,000
Dubai	23	22	0	1	—	3	2	0	1	38,000
Sharjah	1	0	1	0	14,445	1	0	1	0	14,445
Oman	159	126	0	33	1,221	31	11	0	20	238,000
South Yemen	3	1	0	2	22,000	3	1	0	2	22,000
Syria	4	0	1	3	39,000	4	0	1	3	39,000
Turkey	93	44	10	39	146,196	50	8	5	37	78,600

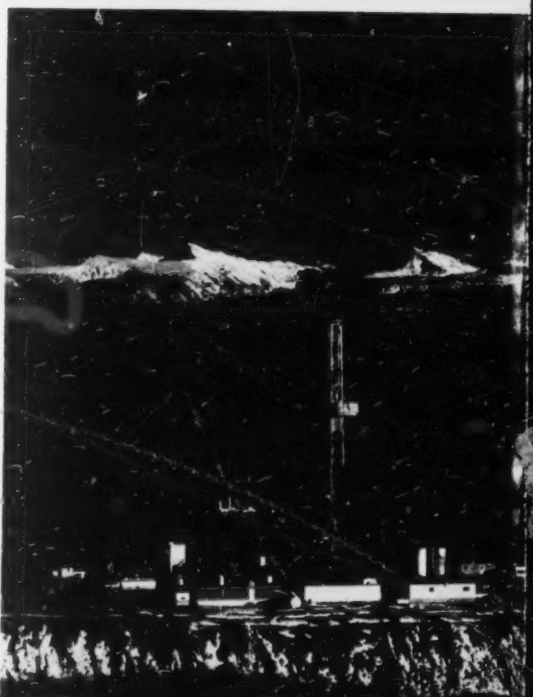
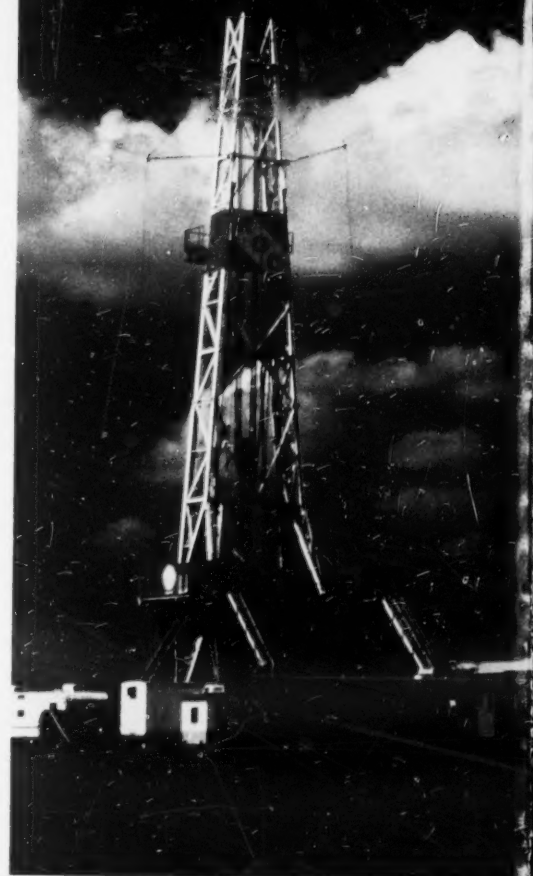
World well completions—1982 AAPG, API data (continued)

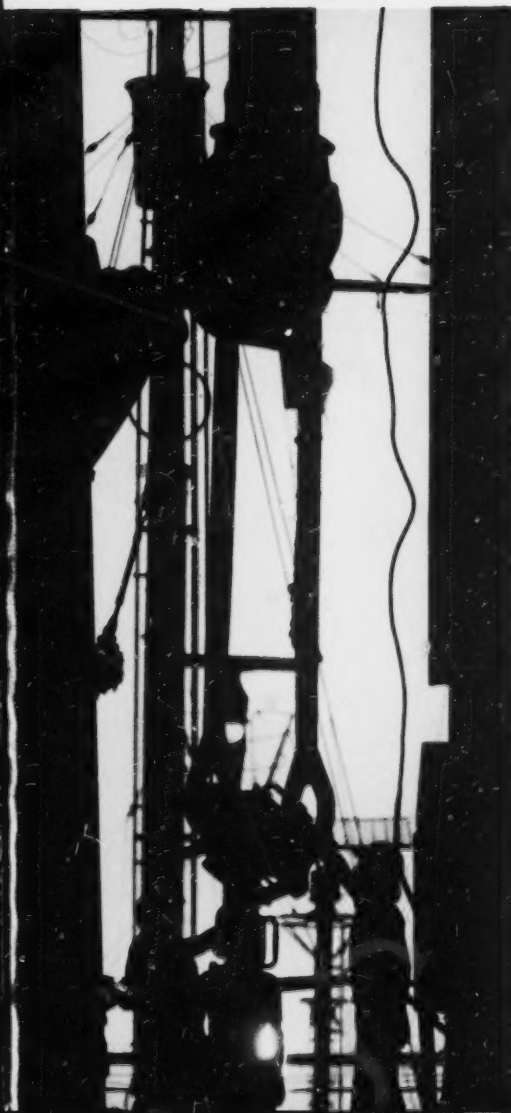
Country	Total wells	Oil	Gas	Dry	Footage Meters	Total Wildcats	Oil	Gas	Dry	Footage Meters
Africa										
Angola	32	21	0	11	314,210	15	5	0	10	153,497
Angola-Cabinda	39	31	1	7	203,186	7	1	1	5	37,576
Benin	2	2	0	0	13,448	0	0	0	0	0
Cameroon	75	64	3	8	483,780	11	2	3	6	60,890
Congo	53	42	0	11	312,525	9	3	0	6	74,768
Equatorial Guinea	4	0	0	4	24,180	4	0	0	4	24,180
Gabon	56	34	0	22	417,091	16	6	0	10	121,570
Ghana	1	0	0	1	4,400	1	0	3	1	4,400
Ivory Coast	26	7	3	16	239,565	14	2	3	9	135,259
Kenya	1	0	0	1	6,320	1	0	0	1	6,320
Mali	1	0	0	1	20,103	1	0	0	1	20,103
Niger	2	1	0	0	1,337,506	30	4	2	24	294,790
Nigeria	144	104	2	38	95,025	10	1	1	8	95,025
Rep. of S. Africa	10	1	1	8	30,075	3	0	0	3	30,075
Somali Rep.	3	0	0	3	8,000	1	0	0	1	8,000
Sierra Leone	1	0	0	1	17,696	1	0	0	1	17,696
Senegal	1	0	0	1	54,256	2	0	2	0	25,704
Tanzania	5	0	4	1	55,297	4	0	0	4	38,592
Zaire	8	4	0	4						
North Africa										
Algeria						1				10,000
Egypt	132	106	0	26	1,167,500	82	73	0	9	805,500
Libya	110	88	3	19	942,000	34	16	3	15	245,000
Morocco	12	1	1	10	98,109	11	1	1	9	91,978
Sudan	17	6	0	11	174,052	17	6	0	11	174,052
Tunisia	34	13	2	19	304,010	21	4	1	16	211,617
South America										
Argentina	822	656	34	132	1,771,181	107	37	10	60	261,186
Barbados	16	16	0	0	101,384	0	0	0	0	0
Belize	2	0	0	2	12,766	2	0	0	2	12,766
Bolivia	31	10	10	11	82,032	18	2	8	8	45,753
Brazil	1,045	700	32	343	1,483,923	328	89	6	233	712,143
Chile	118	69	16	32		41	16	8	17	
Colombia	167	99	4	64	1,276,156	73	15	2	56	473,056
Dominican Rep.	1	0	0	1	3,948	1	0	0	1	3,948
Ecuador	27	23	0	4	260,671	5	2	0	3	90,934
Guatemala	12	3	0	9	120,092	9	1	0	8	100,586
Guyana	2	1	0	1	3,449	2	1	0	1	3,449
Jamaica	4	0	0	4	49,139	4	0	0	4	49,139
Mexico	336	174	64	98	1,203,233	65	10	8	47	287,476
Paraguay	1	0	0	1	2,926	1	0	0	1	2,926
Peru	149	134	4	11	1,215,741	12	6	2	4	135,938
Surinam	3	0	0	3	7,478	3	0	0	3	7,478
Trinidad-Tobago	200	169	5	26	252,937	23	9	1	13	53,057
Venezuela	1500					250				
Far East										
Bangladesh	4					2		2		27,000
Brunei	57					6		4	2	46,000
Burma						19				
India										
Indonesia	323	77	26	220		167	19	7	141	
Japan	30					27				
Sabah (E. Malaysia)	24					5				
Sarawak (E. Malaysia)	34					11				
Malaysia Pen.	30									
Pakistan	26					10				
Philippines	15					13				65,000
Taiwan	17					13				
Thailand	45					30				
Europe										
North Sea										
UK	128	29	22	77	1,356,133	101	18	13	70	1,040,733
Norway	70	23	20	27	537,995	43	9	15	19	414,210
Netherlands	59	15	17	27	554,866	45	6	10	29	409,866
Denmark	18	15	0	3	149,744	4	1	0	3	51,744
West Germany	8	0	1	7	81,107	8	0	1	7	81,107
Eire	4	0	0	4	36,000	4	0	0	4	36,000
UK land	24	5	0	19	74,436	22	3	0	19	66,700
Norwegian Sea	7	0	3	4	70,164	7	0	3	4	70,164
Sweden	19	2	0	17	15,585	19	2	0	17	15,585
Denmark land	1	0	0	1	8,203	1	0	0	1	8,203
Netherlands land	38	5	27	6	352,627	13	0	9	4	127,000
W. Germany land	110	65	10	35	1,090,286	54	11	10	33	704,624
Austria	76	27	18	31	471,415	37	6	9	22	266,293
Switzerland	4	0	0	4	21,002	4	0	0	4	18,036
France	132	70	3	59	682,274	50	7	2	41	271,877
Portugal	2	0	0	2	24,216	2	0	0	2	24,216
Spain	32	13	3	16	260,171	19	1	3	15	179,786
Italy	161	18	52	91	1,269,419	103	9	27	67	898,666
Malta	1	0	0	1	16,713	1	0	0	1	16,713
Greece	18	2	0	16	206,000	14	0	0	14	166,000
Yugoslavia	148	33	5	110	1,075,512	48	10	0	38	447,692
United States										
	88,106	40,298	18,953	28,855	401,483,666	16,470	2,582	2,265	11,623	95,587,432
Canada										
West	6,285	2,503	2,555	1,227		2,288	761	732	795	
East	179	32	67	80		58	5	8	45	

(Some data not available)

Drilling depth records USA

State, district	Well	Location, county, parish	Total depth	Year	Formation	Results
Oklahoma	Lone Star 1	27-10n-19w, Rogers	31,441	1974	Arbuckle	Gas at 13,100
Texas West	Hunt 1-9	Cerf Pecos Ranch	29,670	1982	Ellenburger	Dry
Texas Panhandle	Chevron 1	21-L-J.M. Lindsay, Wheeler	26,566	1977	Ellenburger	Gas 25,141-26,518
Wyoming	Rainbow Resources 1-34	Federal 34-27n-103w, Sublette	25,764	1978	Madison	—
Louisiana, South	Martin 1	Echart 40-4s-4e, St. Landry	25,703	1981	—	—
Mississippi	Placid 1	Owen 25-3n-4w, Hinds	25,640	1977	Smackover	Dry
Texas, Dist. 2	Chevron 1	Jacobs Goliad	24,325	1973	—	—
Texas, Dist. 1	Phillips 1	Neuces "A" ACH&B, A-36, McMullen	24,220	1965	Smackover	Dry
Louisiana, Central	Placid Justiss	Mears 1 La. Central LaSalle	24,200	1976	Jurassic	Dry
Texas, Gulf Coast	Falcon-Sea-board 2-A	Baer Ranch Matagorda	22,971	1965	Frio	Gas
New Mexico, SE	Skelly 1NM "P"-Federal	Lea	22,926	1968	Ellenburger	—
Louisiana offshore	Gulf St. 3529	Lease West Delta 27	22,840	1968	Miocene	Gas
California	Tenneco-Superior 64-X-34	Sand Hills, Kern	22,711	1974	L. Miocene	—
Texas, Dist. 4	Shell	J. Poitevent, A-1627, Webb	22,528	1973	—	—
Gulf of Mexico Fed.	Gulf	Destin Dome	21,988	1975	Miocene	Dry
Utah	Placid 1	WBX-32-16s-1w, Juab	21,845	1980	—	—
Pennsylvania	Amoco 1	Svetz Somerset	21,460	1975	Cambrian	Dry
Alabama	Damson 1	Taylor-Odom 13-3n-4w, Washington	21,138	1971	Norphlet	Dry
Texas, East	Shell 2	Barrett Stephen Greenwell Sur., Hill	20,325	1968	Smackover	Dry
Alaska	Husky 1	Tunalik 20-10n-36w, UBM	20,335	1979	Lisburne	Dry
West Virginia	Exxon 1	Gainer-Lee Calhoun	20,222	1974	Basement	Dry
Colorado	Mobil 52-19	Piceance Creek G19-2s-96w, Rio Blanco	19,710	1968	Wasatch	Gas
Florida	Bass 12-2	Collier Collier	18,670	1975	Jurassic	Dry
New Jersey	Gulf Block 857	Baltimore Canyon	18,554	1978	—	—
Arizona State	Phillips 1-A	2-7s-10e, Pinal	18,013	1980	Basement	Dry
Texas, North	The Grande Corp. 1	Harshbarger Grayson	18,008	1960	Ordovician	Dry
Nevada	Mobil 1-A	Virgin River 9-15s-68e, Clark	17,500	1980	—	—
Michigan	McClure 1-8	Gratiot	17,466	1975	Precambrian	Dry
Montana	Trans-Tex-Sun 2	Henderson-Lorenson 33-11n-13w, Granite	17,375	1981	—	Dry
Arkansas	MRT 1	Douglas Hempstead	17,349	1979	—	—
Virginia	Gulf 1	Price Russell	17,003	1977	Precambrian	Dry
Idaho	Exxon 1	Myers-Federal 14-14n-35e, Clark	16,770	1983	—	Dry
North Dakota	Gulf 1-3-4A	Zabolotny 3-14n-98w, Little Knife, Billings	15,380	1978	Red River	Oil
Kentucky	Exxon 1	Duncan 5-M-22, Webster	15,200	1977	Cambrian	—





Drilling depth records USA — Continued

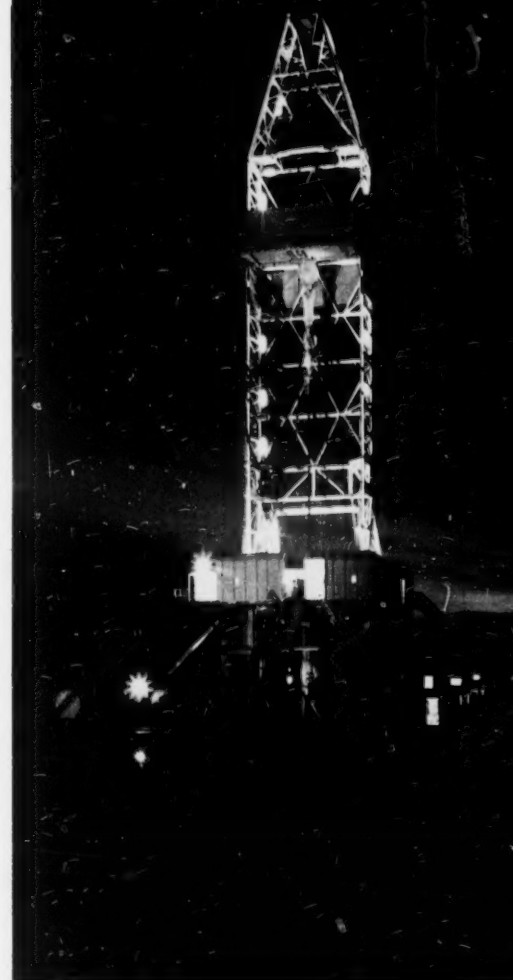
State, district	Well	Location, county, parish	Total depth	Year	Formation	Results
Illinois	Texas Pacific 1 Streich Comm.	Pope	14,942	1976	Granite	Dry
New Mexico, NW	El Paso 29-5 Unit 50	Rio Arriba	14,423	1961	Cambrian	Dry
New York	NYSNGCO 1 Olin	Woodhull Twp., Steuben	13,500	1959	Sub-Potsdam	Dry
Washington	Shell LA-ET	offshore Pacific County	13,179	1966	Eocene	Dry
Oregon	Mobil 1 Suth-36-24s-5w, erland Unit	Douglas	13,177	1979	Eocene	Dry
Maryland	Texas Eastern 2 Seibert	Garrett	11,617	1973	Juniata	Dry
Ohio	Amerada 1 Ullman	3l-Elk Township, Noble	11,442	1967	Precambrian	Oil at 2,300-2,946*
Tennessee	Gulf Spinks	24-2s-13e, Henry	10,748	1967	Cambrian	Dry
North Carolina	Standard (Jer-Daresey) 1 Hatteras Light	Dare	10,044	1946	Granite	Dry
Nebraska	Chevron 1 Chevron-Duncan-Compton	31-16n-58w, Kimball	9,971	1979	Precambrian	Dry
South Dakota	Luff 1-19 Dworshak	19-23n-6e, Harding	9,771	1976	Winnipeg	Oil
Kansas	Mobil 1 Cunningham Est.	13-34s-37w, Stevens	8,713	1964	Granite	Dry
Georgia	Hunt 1 Stalvay	Lowndes	8,550	1973	Basement	Dry
Indiana	GE WD-2	19-7s-37w, Posey	7,980	1972	Knox	Dry
Iowa	Oil Development 1 Wilson	Page	5,305	1930	Precambrian	Dry
Vermont	Gregoire	Mallets Bay, Lake Champlain	5,075	1959	Stony Point	Dry
Missouri	Mammoth Producing Co. 1 Big Oaks	Mississippi	4,902	1966	Roubidoux	Dry
Wisconsin	Wisconsin Oil Refining 1 Jensema	Oil Sheboygan	4,405	1949	Granite	Dry
Minnesota	Northern Nat-ural 1 Osseo	24-119n-22w, Hennepin	4,000	1975	Precambrian	Dry
South Carolina	USGS Strat Test OC-3	Dorchester	3,780	1977	Triassic	Dry

Producing depth records USA

State, district	Well	Location, county	Producing depth	Year	Formation	Result
Texas	Chevron 1 Panhandle Ledbetter	Block L, Sec. 21, J.M. Lindsay Sur., Wheeler	26,518	1977	Eilenberger	Gas
Oklahoma	Mesa 2-29 Tipton	29-11n-25w, Beckham	24,969	1982	Springer	Gas
Texas, West	Exxon McComb GU	4.5 miles E. of SE Gomez, Pecos	24,600	1981	Eilenberger	Gas
Louisiana	SouthTexaco	Caillou Island, SL 4666 1	21,862	1969	Miocene	Gas
Mississippi	Shell 5-A Cox	29-3n-3e, Rankin	21,727	1976	Norphlet	Gas
Louisiana	Gulf 12 SL	South Timbalier Bay	21,672	1968	Miocene	Oil
Alabama	Offshore Mobil 1 SL 347	TR 76, Lower Mobile Bay, Baldwin	20,926	1983	Smackover	Gas
Wyoming	CIG 1-6-36-866-36n-86w, Bulfrog Unit	Natrona	20,510	1982	Sundance	Gas
Texas, Dist. 3	Tenneco 1 American Fletcher	Brazoria	18,080	1973	Lower Frio	Gas
California	Tenneco-Union GBR et al., 66X	3-27s-22e, Kern	18,060	1975	Lower Miocene	Oil
Utah	Gulf 1-34-Z-3 34-1n-3w, Ute Tribal	Duchesne	17,732	1974	Wasatch	Oil

Producing depth records USA — Continued

State, district	Well	Location, county	Producing depth	Year	Formation	Result
Colorado	Champlin 2 Shell Creek 44-27 Gov- ernment	27-12n-99w, Moffat	17,632	1977	Nugget	Gas
New Mexico, SE	Pure 1 Red Hill Unit,	32-253-33e, Lea	17,684	1964	Devo- nian	Gas
Gulf of Mexico, OCS	Well 1	Ship Shoal Block 28	16,664	1975	Miocene	Gas
Texas, North	States 3 McAdams	Grayson	16,555	1960	Oil Creek	Gas
Texas, Dist. 2	Pure 1 Kolar	Vienna field, Lavaca	16,521	1961	Wilcox	Gas
Florida	Humble 21 GCR Corp.	Humble LL&E, Blackjack Creek, Santa Rosa	16,135	1972	Smackover	Oil
Texas, Dist. 1	Mobil 1 Morri- son	Val Verde	14,940	1960	Ellen- burger	Gas
Alaska	Marathon 4 Beaver Creek	34-7n-10w, Seward Meridian	14,996	1973	Tyonek	Oil
Texas, East	Buttes Re- sources 1 Gail King	Bear Grass, Leon	14,725	1977	Cotton Valley	Gas
North Dakota	Mesa 1-13 Brandvik	13-147n-96w, Dunn	14,343	1979	Red River	Gas
West Virginia	Exxon 1 McCoy	Washington District, Jackson	14,300	1975	Cambrian	Gas
Texas Dist. 4	Shell 4 St. Tract 392	Red Fish Bay, Nueces	14,023	1966	Frio	Gas-cond.
Montana	Pennzoil 1 Nohly	26-26n-59e, Richland	12,915	1972	Red River	Oil
Louisiana, N.	Pennzoil 1 McGehee	S. Downsville, Lincoln	12,430	1969	Smackover	Gas
Pennsylvania	Snee et al. 1 Heyn	Sec. Ex. Uniontown Quad., Fayette	11,510	1964	Tuscarora	Gas
Arkansas	Hunt 1 Nations	Columbia	11,195	1969	Smackover	Gas-cond.
New Mexico, NW	Tenneco 1 Pah3-25n-11w, San Juan		10,958	1971	Paradox	Oil
South Dakota	Depco 41-22 Federal	22-23n-5e, Harding	9,150	1973	Red River	Oil
Ohio	Tri-State 1 Sell Unit	Columbiana Lisbon field, Colum- biana	8,493	1969	Cambro- Ordo.	Gas
Maryland	Cumberland etGarrett al., Kerr Unit 604		8,658	1966	Oriskany	Gas
Nevada	Texota 1-34 Eagle Springs	Nye	8,581	1967	Tertiary	Oil
Michigan	Michigan Gulf 1 Bateson	Kawkawlin, Bay	7,850	1946	Salina	Oil (now abd)
Kentucky	Inland Gas 590 White heirs	Boyd	7,598	1967	Anbetem	Oil
Nebraska	Braden 1 State	Kimbail	7,438	1964	Dakota	Oil
Virginia	Clinchfield Coal Co. 193	Dickenson	7,218	1957	Devonian	Gas
Arizona	Texaco 1 Navajo	36-41n-30e, Apache	6,793	1960	Devonian	Oil
Kansas	Mobil 1 Creamer Estate	13-34s-37w, Stevens	6,774	1967	St. Louis	Gas
New York	Transamerican Petroleum 1 Wilman	Middlebury Twp., Wyoming	5,425	1963	Theresa	Gas
Illinois	Cities Service 9 Vaught	33-2s-9e, Wayne	5,373	1962	Devonian	Oil
Indiana	V.R. Gallagher 1 Chilton	3-5s-14w, Posey	4,508	1977	Harrods- burg	Oil
Oregon	Reichhold Energy	Mist Field Columbia	3,177	1979	Cowlitz	Gas
Tennessee	Greenup-Da- vid et al., 1 Coal Creek	Anderson	3,059	1954	Chatanooga	Gas
Missouri	Wm. Grune- wald 1 Currie	Holt	2,975	1959	Ordovician	Oil



**Gas production
(billions cu ft)**

1983

**WESTERN
HEMISPHERE**

Argentina	549.6
Bolivia	98.4
Brazil	142.2
Canada	2,414.1
Chile	169.8
Colombia	185.3
Ecuador	16.8
Guatemala	—
Mexico	1,479.5
Peru	33.6
Trinidad	106.1
United States	16,581.0
Venezuela	559.2
Total	22,335.6

EUROPE

Austria	42.4
Denmark	21.0
France	289.3
West Germany	605.2
Greece	—
Italy	450.1
Netherlands	2,678.9
Norway	861.4
Spain	12.0
United Kingdom	1,395.3
Total	6,355.6

MIDDLE EAST

Bahrain	193.8
Iran	500.2
Iraq	20.4
Israel	13.2
Kuwait	142.8
Oman	86.7
Qatar	87.5
Saudi Arabia	381.5
Syria	8.4
Turkey	27.8
United Arab Emirates	198.5
Total	1,660.8

ASIA-PACIFIC

Afghanistan	158.4
Australia	423.5
Burma	16.8
Malasia	45.6
Brunei	316.3
India	103.1
Indonesia	481.8
Japan	72.9
New Zealand	113.2
Pakistan	341.4
Taiwan	60.0
Thailand	54.7
Total	2,187.7

AFRICA

Algeria	707.0
Angola	69.6
Egypt	102.7
Gabon	4.8
Ivory Coast	—
Libya	94.3
Morocco	3.6
Nigeria	145.0
Tunisia	16.8
Total	1,143.8

COMMUNIST

China	371.0
Romania	1,200.0
USSR	18,903.0
Other	909.0
Total	21,383.0

World Total 55,066.5

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Raul Urueta Insignares

the group's agreement. Production above ceilings and discounting, often camouflaged by lenient payment terms, were common.

Tensions between the Persian Gulf producers and agreement violators reached extreme levels. By the beginning of 1983, there were doubts that the organization could hold together.

OPEC's problems were monstrous. The group's total revenues had fallen from \$278 billion to an estimated \$160 billion in 1983. Its market had dropped from 31 million b/d in 1979 to 15-16 million b/d. The 1982 production limits imposed severe hardships on some exporting countries.

When it entered the negotiations that led to the March 1983 accord, OPEC faced the fact that its members had among them spare productive capacity of perhaps 14 million b/d, much of it with lifting costs of only \$1-3 bbl. Meanwhile, non-OPEC production costing \$5-10 or more was flowing at capacity.

In theory, OPEC members could have grabbed back their lost shares of the market by producing at near maximum rates and selling at cost.

Because of their revenue needs, some of the harder pressed countries in OPEC argued at first for maximum pro-

OPEC current account balances

	1980	1981	1982*	1983†
	Billion \$			
Saudi Arabia	39.8	39.6	1.9	-20.0
United Arab Emirates	9.8	8.7	4.2	2.9
Kuwait	16.7	12.4	5.8	7.1
Qatar	3.6	3.6	1.5	0.7
Iran†	1.1	-2.4	5.6	4.0
Iraq†	11.6	-9.4	-12.5	-11.8
Algeria	0.2	0.5	-1.2	-0.6
Ecuador	-0.7	-1.1	-1.5	-0.6
Gabon	0.7	0.6	0.4	0.4
Indonesia	2.8	-1.2	-6.7	-5.7
Libya	9.8	-3.4	-0.5	-2.8
Nigeria	2.9	-6.8	-4.1	-3.4
Venezuela	4.7	2.9	-3.4	-0.6
Total	103.0	44.0	-10.5	-30.4

*Preliminary. †Estimated. ‡Speculative.

Source: Bankers Trust Co.

duction, whatever the effect on crude prices. Fear of a price war prevented that from happening. As a group, at least, OPEC recognized that an oil price collapse would have been ruinous.

With its agreement to limit production from 12 of the 13 members to 12.5 million b/d, with Saudi Arabia balancing

the market after that, OPEC formally accepted the role of the world's "swing" producer. Saudi Arabia, of course, was the major swing factor.

William L. Randol, an analyst with First Boston Corp., says that's a key to OPEC success in its cartel action. "The handful of Persian Gulf producers hav-

Chronology of the Embargo

THE ARAB OIL EMBARGO OF 1973-74 radically changed the international oil market and role of exporting countries. Many changes are still under way.

What follows are the main events of the embargo, arranged chronologically, and significant events that followed the embargo and led eventually to the historic OPEC price cut of 1983.

This timeline was compiled by American Petroleum Institute.

1973

Oct. 6 War erupts in the Mideast. Immediate effects are the closing of three east Mediterranean pipeline terminals, export curbs in Italy and Spain, and tanker rate increases.

Saudi defense minister ties production boost to U.S. withdrawal of support for Israel and to the withdrawal of Israel from Arab lands occupied during the 1967 war.

Oct. 7 Palestinian Liberation Organization (PLO) calls for complete halt to Arab oil production.

Iraq nationalizes Exxon and Mobil interests in the Basrah Petroleum Co. and calls on other Arab states to nationalize U.S. oil interests and to suspend exports to the U.S. and other supporters of Israel.

Oct. 9 Kuwait National Assembly issues statement condemning U.S. support of Israel and proposes reconsideration of the export of Kuwaiti oil to the U.S.

Oil companies meet with Organization of Petroleum Exporting Countries nations in Vienna to revise 1971 Tehran price pact. Companies propose a 15% increase in posted prices plus inflation and adjustment. OPEC proposes 100% price increase and price escalator clauses.

Oct. 12 Price negotiations break down when companies insist on a 2 week recess to consider OPEC proposals. OPEC insists on a 1 week recess.

Oct. 16 Persian Gulf countries meet in Kuwait and announce a 70% increase in posted prices.

Oct. 17 Conference of oil ministers of Saudi Arabia, Kuwait, Iraq, Libya, Algeria, Egypt, Abu Dhabi, Bahrain, and Qatar announces a production cutback of 5% of September 1973 production level, with a similar reduction each succeeding month until Israel withdraws from Arab territory occupied during the 1967 war. Exceptions made for "friendly" states.

Oct. 18 Saudi Arabia and Qatar announce a 10% production cutback until the end of November. Abu Dhabi cuts off exports to the United States. Libya cuts production by 5%.

Oct. 19 Libya embargoes U.S.

Oct. 20 Saudi Arabia announces U.S. embargo.

Oct. 21 Iraq disassociates itself from Kuwait agreement and calls for breaking Arab diplomatic relations with the U.S. and selective production cuts

How the U.S. reduced its reliance on OPEC crude

	1973	1974	1976	1978	1980	1982
	Percent					
Share of U.S. imports						
OPEC	48.25	54.02	69.97	69.95	63.07	43.23
OPEC only*	15.03	12.67	33.84	36.61	37.77	17.98
Other imports	51.75	45.98	30.03	30.05	36.93	56.77
Share of U.S. oil consumption						
OPEC	17.44	19.83	29.30	31.04	25.55	14.45
Non-OPEC	18.71	16.88	12.58	13.34	14.96	18.98
All imports	36.15	36.70	41.88	44.38	40.51	33.43

*Organization of Arab Petroleum Exporting Countries.

Source: American Petroleum Institute

ing the longest-lived oil reserves—Saudi Arabia, Kuwait, and the U.A.E.—also have the smallest populations and the largest monetary reserves with which to weather the storm of a depressed market," he told a National Foreign Trade Council Foundation conference.

"As long as one or more of the key Gulf producers, in particular Saudi Arabia, are willing to accept a very low level of output as a short-term expedient to support oil prices, OPEC appears to have a good chance of surviving the

current weak market environment despite some fraying at the edges that might occur."

Formalization by Saudi Arabia of the swing producer role it had played before was among several reasons Randol gave for believing OPEC could succeed in its cartel action. Among the others:

- The March 1983 agreement disallowed carryover of unused quotas. The 1982 agreement enabled producers to make up later for below-quota production in a certain period. That eventually

led to excessive production, which weakened the market.

- Individual quotas were relatively flexible. Iran received a quota near its sustained ability to produce because it was likely to go its own way on output and pricing anyway. Iraq's quota assumed that it would have access to the Syrian pipeline, which it had only briefly, leaving about 400,000 b/d that the swing producers could make up.

- A degree of cooperation was growing between OPEC and non-OPEC producers. Mexico was enforcing a production limit of sorts, and North Sea prices were staying in line with the OPEC marker.

Randol made his predictions in May, and they held true through the rest of the year.

And other factors came into play. The U.S. dollar, in which crude is denominated in global markets, strengthened throughout 1983. That boosted purchasing power of OPEC member revenues, even if the totals didn't increase.

Inventory withdrawals ended sometime in the third quarter of 1983, which boosted purchases of OPEC crude. And by the end of the fourth quarter there appeared to be a recovery in demand for petroleum products, although its

aimed at the U.S. Iraq also nationalizes Dutch interests in Basrah Petroleum Co. and embargoes Holland.

Algeria embargoes Holland.

Kuwait embargoes the U.S. and cuts production by 10%.

Qatar embargoes the U.S., as do Bahrain and Dubai.

Oct. 22 The United Nations (UN) passes a cease-fire resolution. Saudi Arabia embargo is understood to include Holland.

Oct. 23 Abu Dhabi and Kuwait cut off exports to Holland.

Oct. 24 Qatar embargoes Holland.

Oct. 25 Oman embargoes the U.S. and Holland.

Oct. 30 Libya and Bahrain embargo Holland.

Nov. 2 Saudi Arabia confirms embargo to Holland and any country helping Holland. Announces three categories: (1) embargoed; (2) exempt or most favored; (3) nonexempt but nonembargoed.

Kuwait cuts production by 25% of prewar average.

Nov. 3 Conference of Arab petroleum ministers gets under way in Kuwait.

International Confederation of Arab Trade Unions decides to boycott all U.S. and Dutch land, air, and sea transport operations, as well as commodities imported from these two countries.

Nov. 4 Arab oil ministers decide to cut production to 25% below September level. Further reduction of 5% scheduled for December.

Nov. 6 Japan issues statement supporting Arab cause.

Nov. 16 Kuwait cuts production to 30% below September level.

Nov. 17 Vienna meeting between oil companies and Iran, Saudi Arabia, Kuwait, Iraq, Abu Dhabi, and Qatar to determine a pricing formula meets with no success.

Nov. 18 Vienna meeting of Arab oil ministers schedules 5% cutback for December but exempts European Economic Community (except Holland). Ministers toughen stand against Japan, want Japan to break diplomatic and economic relations with Israel to qualify for "friendly" status.

Nov. 22 Japan issues new statement on the Middle East calling for Israeli withdrawal from occupied lands: "Depending on future developments, Japan may have to reconsider its policy towards Israel."

Nov. 24 Shah of Iran calls for relaxation of the oil embargo and states that Iran is willing to make

How OPEC quotas, capacities compare*

	Quota	— Productive capacity —	
		Maximum sustainable	Available
		Thousand b/d	
Algeria	725	900	900
Ecuador	200	225	225
Gabon	150	150	150
Iraq	1,200	3,500†	900
Iran	2,400	5,500†	3,000
Indonesia	1,300	1,650	1,650
Kuwait	1,050	2,500†	1,550†
Libya	1,100	2,100	1,750
Nigeria	1,300	2,200	2,200
Qatar	300	600	600
Saudi Arabia	— \$	10,300†	7,300†
United Arab Emirates	1,100	2,415	1,245
Venezuela	1,675	2,400	2,200
Total	12,500	34,440	23,670

*Quotas established in March 1983. Capacities as of July 1982. †Loss in sustainable capacity due to war uncertain. ‡Includes share of Neutral Zone. §Saudi Arabia to make up difference between production quotas and 17.5 million b/d or total demand for OPEC crude.

Source: Bankers Trust from Central Intelligence Agency data for capacities

outside the organization. That meant OPEC's market share losses of the 1970s and early 1980s weren't due for an early reversal.

But that situation couldn't last forever. OPEC—especially the Middle Eastern members of the group—still commanded an overwhelming share of the world's

reserves.

According to British Petroleum Co. plc, the Middle East accounted for 54.4% of worldwide oil reserves and 25.3% of gas reserves at the end of 1982. And many Middle Eastern countries conducted only minimal exploration programs.

The non-OPEC nations that gained market share at OPEC's expense during the 1970s did so as the result of feverish exploration efforts. To retain their incremental market shares, they would have to continue making big discoveries, a doubtful prospect.

At the Oxford Energy Seminar in August 1983, Institut Francais du Petrole Pres. Pierre Desprairies said, "There should not be any great increase in non-OPEC petroleum production between now and 1990 from currently producing countries."

Among countries that increased output during the period, the U.S. isn't expected to do more than keep flow relatively constant, even with the big Santa Maria basin discovery, he said. The U.S. increase came from Alaska, which reached full flow in 1980.

Mexico had "the strongest technical potential for increase," Desprairies said. But in 1983 the country had reduced its

September 1973, beginning Jan. 1, 1974. Belgium will get its September level, retroactive to Dec. 1, 1973. Most favored countries to get actual needs.

1974

Week of

Jan. 4 Bids for Nigerian participation crude reached \$22.60/bbl. Libya informs bidders for its oil that the price will be a flat \$20/bbl. Iraq asks \$21.50/bbl.

Jan. 5 Beirut newspaper al-Hayah publishes a report saying Libya is supplying oil to the U.S. via Caribbean refineries.

Jan. 7 U.S. Secretary of Defense Schlesinger warns Arabs that embargo might ultimately provoke military reprisals. Kuwait responds by mining its oil fields. Abu Dhabi follows suit.

Jan. 7-9 Unable to agree on the price of oil, the OPEC conference in Geneva decides to freeze the posted price of crude for 3 months. Decision is made after lengthy debate as to whether the Geneva II currency agreement should continue to be applied. Under the Geneva II agreement, postings in the Persian Gulf, Libya, and Nigeria were to move up or down on a monthly basis in line with an index of the fluctuation of the U.S. dollar against 11 other world currencies. But, because of the strength of the U.S. dollar, future use of the formula could result in a significant reduction in posted prices in dollar terms in the

Jan. 9 The Organization of Arab Petroleum Exporting Countries (Oapec) denies the al-Hayah report of embargo leakages

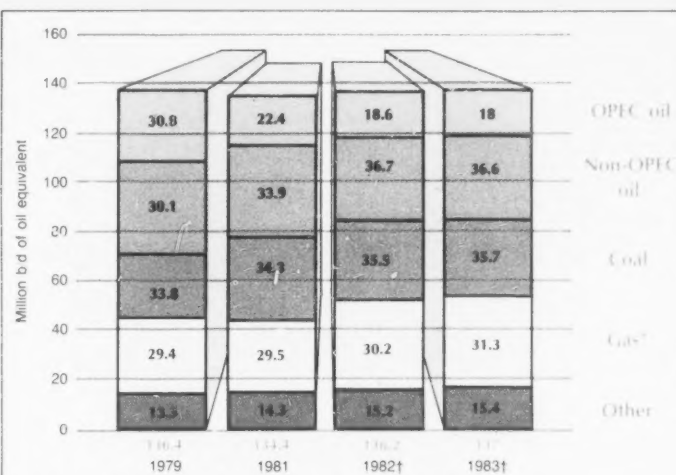
The U.S. invites Canada, Great Britain, West Germany, France, Italy, Japan, the Netherlands, and Norway to meet Feb. 11 in Washington to develop new cooperative measures to deal with the growth of global energy demand and to develop new energy sources. Also sends letter of clarification to Abu Dhabi, Algeria, Ecuador, Gabon, Indonesia, Iran, Iraq, Kuwait, Libya, Nigeria, Qatar, Saudi Arabia, and Venezuela (the members of OPEC).

Jan. 17-18 Oil-consumer members of the International Monetary Fund meet in Rome to assess the balance of payments deficits faced by the major oil-importing countries and to try to work out a collective approach.

Jan. 18 France calls for a UN-sponsored energy conference.

Negotiations are under way for bilateral oil deals. Japan is trying to arrange supplies from Iran, Iraq, Saudi Arabia, and Abu Dhabi. France

World primary energy consumption



*Includes natural gas liquids. †Estimated. Source: Gulf Refining & Marketing Co.

exploration and development investments as it wrestled with monumental economic problems.

In the U.K. North Sea, development activity had received a boost from an offshore tax reduction, but fields were smaller and likely only to be able to offset declines from larger fields already on production.

Production boosts from the Norwegian North Sea were unlikely because of the government's cautious policies and emphasis on natural gas.

Desprairies expected Soviet production to increase through 1990. But he said the U.S.S.R. probably would not increase its exports to non-Warsaw Pact nations to a great degree because it would have to deprive Eastern European customers to do so.

Desprairies said, "New producing countries of the Third World should not be dangerous competitors for OPEC production in the next few years."

"As for further petroleum production in industrialized countries, excluding the United States and the North Sea, it is not promising."

For countries with the reserve base to keep exporting, therefore, the outlook was for gradual recapture of market share, based on production declines

Chronology of the Embargo — continued

signs an agreement with Saudi Arabia. Britain, Italy, and West Germany are negotiating with Iran and Saudi Arabia.

Jan. 22-23 Joint meeting is held in Cairo between the Arab oil ministers and foreign ministers of seven African countries. Meeting results in the establishment of a \$200 million fund to help finance African economic needs. The African nations are assured of 12 million tons/year of oil.

Jan. 29 The Kuwait government and owners of the Kuwait Oil Co. (BP and Gulf) sign an agreement giving the government a 60% interest in the company's operations in Kuwait. At the end of 1979, the government expects a 100% takeover but will be free to call for fresh negotiations on terms of the agreement at any time.

Feb. 4 Spot market crude oil prices are reported to be nosediving because large quantities of spot market crude are suddenly available. Factors include the U.S. mandatory allocation system, which removes the incentive for U.S. refiners to secure overseas supplies at any cost.

Feb. 11 Iran gives Pakistan a special \$4 discount off the \$17.04/bbl "auction price" on light crude, and other buyers are seeking similar reductions. Some exporting country oil sales are collapsing as buyers balk at prices.

Libya nationalizes the assets of Standard Oil Co. of California, Texaco, and Arco in Libya in a "practical and decisive reply" to President Nix-

on's summoning of the Washington Energy Conference.

Feb. 11-13 Washington Energy Conference proposes establishment of a coordinating group, a conference of consumer countries at the foreign minister level, followed by a third conference of producing and consuming countries.

Feb. 13 Arab oil ministers meeting scheduled for 2/14 in Libya is indefinitely postponed due to controversy over whether to lift the embargo against the U.S. Egypt favors relaxation; Syria opposes it.

Feb. 22-25 Thirty-seven nation Islamic Conference is held in Lahore, Pakistan. Libya calls for a differential pricing system for crude according to the political, economic, and religious persuasions of the consuming countries involved. Saudi Arabia and Algeria oppose this.

Feb. 25 Kuwait reportedly fails to receive its asking price for crude in its auction on 2/21.

Mar. 16-17 OPEC conference in Vienna decides to freeze prices for the second quarter of 1974 as a result of a standoff between Saudi Arabia and other OPEC members. Saudi Arabia favors decreasing prices, and the other OPEC nations favor a price increase.

Mar. 19 Arab oil ministers decide to lift the U.S. embargo, subject to review on June 1. Syria and Libya dissent from the decision, and Algeria interprets the agreement as strictly temporary. Egypt,

STRATEGIC PETROLEUM RESERVE

storage sites in Louisiana and Texas for several reasons, including cost, safety, security, and environmental protection.

The salt domes are located close to three primary interstate crude oil pipelines which serve major U.S. petroleum markets.

They are close to the largest refining center in the world—the string of refineries along the Gulf Coast and inland refineries fed by pipelines from offshore terminals and producing fields.

However, the storage sites on the Gulf Coast are remote from the refineries in the Northeastern U.S., the Pacific Coast, Hawaii, Puerto Rico, and the Virgin Islands.

There has been continued pressure in Congress for some regional storage sites—either containing crude or products—at less remote locations. The Energy Department has opposed these because they would require more expensive above ground storage.

The first shipment of SPR oil—412,000 bbl of Saudi Arabian light crude—destined for the West Hackberry storage site near Lake Charles, La., began unloading on July 21, 1977.

Since then, the reserve inventory has been increased at four sites in Texas and Louisiana.

The huge underground caverns being used for storage at Bryan Mound in Texas and West Hackberry, Bayou Choctaw, and Sulphur Mines in Louisiana are dissolved out of geologic structures known as salt domes.

At least 350 of these domes are scattered around the Gulf Coast area of Texas, Louisiana, Mississippi, and Alabama.

The Weeks Island, La., SPR site uses a salt mine for storage. About 95 miles west of New Orleans, the cavern was created through conventional room and pillar mining methods.

The domes took shape millions of years ago when sections of an extensive layered salt deposit were forced upward through the overlying sedimentary rocks.

Sometimes the tops of these salt intrusions—which generally measure 1-3 miles across—are right at the surface or a few feet below. Other salt domes have several thousand feet of cap rock and surface sediments above the salt.

Solution mined storage in a salt dome is initiated by drilling a well similar to an oil well.

Fresh water is pumped down an inner string of steel tubing; the rock salt is dissolved and brine is withdrawn to create the storage chamber.

When the cavern is completed to some specified volume, oil is pumped into the cavern, forcing out much of the remaining brine.

The oil floats on top of the brine, which remains at the bottom of the cavern. To withdraw the oil, fresh water

Status of SPR underground capacity

Storage facilities	Permanent capacity available	Capacity filled
Phase I sites:	(Millions of barrels)	
Bayou Choctaw	46.1	45.1
Bryan Mound	65.6	64.4
Sulphur Mines	26.3	26.0
Weeks Island	73.0	72.3
West Hackberry	48.8	49.0
Total	259.8	256.8
Phase II sites:	Planned capacity	Capacity filled
Bayou Choctaw	10.0	*
Bryan Mound	120.0	81.4
West Hackberry	160.0	37.0
Total	290.0	118.4
Tanks and pipelines	—	3.8
Total for SPR	549.8	†379.1

*A newly leached cavern with 4.5 million barrels of usable capacity will be exchanged for an existing 10-million-barrel cavern owned by Allied Chemical Corporation at the Bayou Choctaw site after leaching is completed. DOE currently expects to complete leaching in August 1984.

†Does not add due to rounding.

Source: DOE.

is injected under pressure and the oil is displaced and forced out.

The oil placed in storage is segregated by several categories of sulfur content and gravity so the specific crude oil needs of refiners likely to be affected by a major oil supply interruption can be met.

Development. The SPR program is being developed in three phases.

The first phase, completed in 1980, involved the conversion of five sites with existing storage capacity, one in Texas and four in Louisiana, plus the construction of a DOE marine terminal at St. James, La.

Phase I sites are at Bryan Mound in Texas and Bayou Choctaw, West Hackberry, Sulphur Mines, and Weeks Island in Louisiana. The Phase I storage capacity totals about 260 million bbl.

Phase II consists of 290 million bbl of storage capacity created by expanding three Phase I sites.

The Bryan Mound site is being expanded by 120 million bbl and the West Hackberry site by 160 million bbl, both by solution mining (leaching) new caverns.

A further 10 million bbl will be added to Phase II through acquisition of additional existing cavern storage at the Bayou Choctaw Phase I site.

Phase III, consisting of approximately 200 million bbl, will involve the further expansion of two existing sites and the development of a new site.

Bryan Mound will be expanded by 40

million bbl and West Hackberry by 20 million bbl. Also, a new 140 million bbl site is being developed at Big Hill, Tex.—the first virgin salt dome acquired by DOE for SPR.

The five storage sites, and Big Hill when it is completed, are served by three tanker terminals. The government owns St. James Terminal, which serves Bayou Choctaw and Weeks Island.

West Hackberry and Sulphur Mines are served by Sun Terminals Inc.'s facility at Nederland, Tex., which also will serve Big Hill. The Seaway Pipeline terminal serves Bryan Mound.

Dedicated pipelines connect the commercial terminals to the SPR caverns. At St. James, the government controls the terminal and the pipeline.

Bryan Mound. The Bryan Mound location is in Brazoria County, Tex., 3 miles southwest of Freeport, Tex.

It is a 225 million bbl facility consisting of 64.8 million bbl of capacity in four existing caverns and 160 million bbl of new leached capacity in 16 other caverns.

In 1983 brine disposal continued at the rate of 869,000 b/d, creating 37.2 million bbl of new cavern storage capacity. The second phase was 87% complete and total capacity was 142.3 million.

The third phase will consist of four 10 million bbl storage caverns. Drilling began in 1983 and surface construction was 84% complete at year end. Leaching is due to begin in 1984.

SPR sites on the Gulf Coast



SPR sites storage capacity					
Site	Location	Phase 1	Phase 2	Phase 3	Total
		Million bbl			
Bryan Mound	Brazoria, Tex.	60	120	40	220
West Hackberry	Cameron Parish, La.	51	160	30	241
Bayou Choctaw	Iberville Parish, La.	36	10	—	46
Weeks Island	Iberia Parish, La.	75	—	—	75
Sulfur mines	Calcasieu Parish, La.	22	—	—	22
St. James terminal	St. James Parish, La.	—	—	—	—
Tanks and pipelines	—	4	—	2	6
Big Hill	Jefferson County, Tex.	—	—	140	140
	Site total	248	290	212	750
	Phase total (cumulative)	248	538	750	

Source: Department of Energy

Water intake is through a 36-in. pipeline from the Brazos River. A 36-in., 14.6 mile pipeline carries the brine 13 miles offshore in the Gulf of Mexico.

Oil fill is via a 30-in., 3.6 mile pipeline to the Seaway terminal. Designed oil injection rate is 240,000 b/d while the sustained rate would be 180,000 b/d.

Drawdown would be through a 30-in. pipeline 3.6 miles to the Seaway docks and 4.6 miles to the Seaway pipeline. The design drawdown capacity is 1,054,000 b/d.

Bryan Mound contained 145.8 million bbl of crude at the end of 1983, 81.4 million of that sour and 64.4 million sweet.

West Hackberry. The SPR site at West Hackberry is in Cameron Parish, La., 21 miles southwest of Lake Charles.

The first phase consisted of 48.7 million bbl of storage in five existing cav-

erns. DOE has added 37.5 million bbl of new storage capacity under the second phase, bringing the total to 86 million.

Drilling began in late 1983 on the third phase, consisting of 30 million bbl.

The project draws water from the Intracoastal Waterway through a 42-in., 4.5 mile pipeline to the site. Leached water is disposed of both through a 26-in., 27 mile pipeline to a point 9 miles offshore in the Gulf and through ten deep injection brine disposal wells 2 miles offshore.

The SPR site is filled with crude through a 42-in., 42 mile pipeline from the Sunoco terminal at Nederland, Tex., Design injection rate is 225,000 b/d and the sustained injection rate is 175,000 b/d.

Raw water design pumping rate is 1.4 million b/d and brine disposal is 1 million b/d through the pipeline into the Gulf.

Drawdown would be via the same 42

in. pipeline to Nederland with a 1.4 million b/d capacity.

West Hackberry contained 86 million bbl of crude at the end of 1983, some 35.7 million bbl of sour and 50.3 million bbl of sweet.

Bayou Choctaw. The Bayou Choctaw site is in Iberville Parish, La., 12 miles southwest of Baton Rouge.

The 36 million bbl original facility, consisting of four equal sized existing caverns, will be augmented with another 10 million bbl of storage in the second phase.

A cavern is being leached which will be exchanged for an existing 10 million cavern at site.

Geological studies were completed in 1983 regarding the optimum location of a new SPR cavern for the third phase.

Oil fill is through a 36-in. pipeline stretching 39 miles to St. James Terminal. Design crude fill pumping rate is 240,000 but sustained system rate is only 110,000 because it would be constrained by brine disposal needs.

Brine disposal is limited to 110,000 b/d through deep well injections. Drawdown would be through the 39 mile pipeline to the St. James Terminal and then through the privately owned Capline pipeline. Design capability is 240,000 b/d.

Bayou Choctaw contained 45.1 million bbl of crude in late 1983, some 26.8 million bbl of sour and 18.3 million bbl of sweet.

Other sites. The Sulphur Mines site is in Calcasieu Parish, La., 2 miles west of Sulphur, La., and 20 miles north of West Hackberry.

Three existing caverns were purchased and filled with 26 million bbl of sour crude. Fill was through a 16-in., 17-mile spur pipeline which connects to DOE's West Hackberry pipeline at the Intracoastal Waterway.

Drawdown of 100,000 b/d would be through that line to the West Hackberry line, and then to the Sunoco Terminal in Nederland, Tex.

The Weeks Island site is in Iberia Parish, La., about 95 miles west of New Orleans. A salt mine, it has been filled with 72.3 million bbl of sour crude.

Drawdown would be through a 36-in., 69 mile pipeline to the St. James Terminal and to Capline pipeline. Design capability would be 590,000 b/d.

DOE began drilling holes at the new Big Hill site in Jefferson County, Tex., in 1983. It eventually will contain 140 million bbl.

Work has been completed at DOE's St. James Terminal in St. James Parish, La., 45 miles southeast of Baton Rouge on the Mississippi River.

The terminal can drawdown a combined 830,000 b/d from the Bayou Choctaw and Weeks Island sites. The crude could be loaded on tankers or transferred into the Capline system.

Sources of SPR crude*

Origin	Million bbl	Percent of Total
Mexico	134.7	35.5
United Kingdom	88.0	23.2
Alaska	31.4	8.3
Libya	23.8	6.3
Saudi Arabia	20.5	5.4
Iran	20.0	5.3
Nigeria	13.9	3.7
Dubai	12.0	3.2
Egypt	8.5	2.2
Oman	6.0	1.6
Ecuador	4.8	1.3
Algeria	4.2	1.1
Texas	2.5	0.7
Gabon	2.4	0.6
Norway	2.4	0.6
Cameroon	1.6	0.4
Venezuela	0.9	0.2
Qatar	0.6	0.2
Other Domestic	0.4	0.1
Peru	0.4	0.1
TOTAL	379.1	100.0

* As of Jan. 1, 1984.

Source: DOE

that it would not be economical to expand the reserve.

The Carter administration planned for 250 million bbl of private stocks, in addition to the SPR.

But Congress has shown no enthusiasm for legislation to require industry to maintain petroleum stockpiles at set levels, the drawdown of which would be controlled by the government in the event of a shortage.

Fill rates. The Reagan administration is proud of its achievements in filling the SPR, but budget constraints have prompted it to continually seek lower fill rates.

It argues the lower rates are justified in the light of the much lower level of U.S. oil imports.

Congress authorized a 300,000 b/d rate in fiscal 1983, but the administration wanted and got only a 220,000 b/d rate.

Then the Energy Department said it couldn't continue to fill the SPR at a 220,000 b/d rate without expensive temporary storage.

It proposed a fiscal 1984 rate of 145,000 b/d, but Congress imposed a rate of 186,000 b/d—the maximum that could be put in the ground using the salt cavern storage.

For fiscal 1985, the administration was seeking a 145,000 b/d rate and Congress was inclined to impose a higher level.

DOE's motives were purely fiscal. The difference between the 186,000 b/d and 145,000 b/d rates was \$489 million in expenditures, which would have an impact on federal budget deficits.

To save money, it even considered

changing the mix of SPR crude purchases from 65% sour/35% sweet to 70/30.

Department officials say that when Congress set a goal of a 750 million bbl SPR, the objective was to protect the nation against a 90 days cutoff of imports.

With today's lower imports, and the current SPR levels of 384 million bbl, it said the nation already has a 90 days supply.

Complaints also have been raised over the prices paid for the crude.

In 1982 a House of Representatives subcommittee charged the DOE was consistently paying too much for SPR crude.

The General Accounting Office investigated, and concluded that during 1981 and 1982 the government paid from 6-16¢/bbl more than major oil companies, on the average.

However, it said that most of the added cost had been incurred during the first part of 1981 and since then the government generally had paid less.

Actual drawdowns. A Congressional committee was considering a bill in early 1984 to require large scale SPR drawdowns and crude sales.

DOE has held a number of drawdown tests. In November 1983 it conducted a test at Bryan Mound to demonstrate the ability to withdraw stored crude oil at rates exceeding requirements, should supplies suddenly be needed to meet a national emergency.

The drawdown test covered a 24 hr period and had the goal of removing 900,000 bbl of crude from various storage caverns at the site.

At the close of the exercise, meters indicated a gross cumulative total of 1,006,870 bbl had been drawn down. All site equipment necessary to the test performed satisfactorily, DOE said.

The test repeated an earlier similar exercise at Bayou Choctaw. In July 1983, 247,772 bbl of crude was pumped from the site to the St. James storage terminal 39 miles away—exceeding the 240,000 bbl goal.

DOE planned to conduct more drawdown tests at existing SPR sites during 1984.

But Energy Sec. Hodel says Congress hasn't given DOE legal authority to sell the crude from a test drawdown, and if it does, he questions "whether the added benefits from an actual sale of oil—which we see chiefly as an enhancement of public confidence in SPR oil and DOE's sale methods—would outweigh the possible risks and disadvantages."

Selling SPR crude during normal oil market conditions won't demonstrate realistically how the SPR would function in an emergency, Hodel says.

Rep. Phil Sharp (D-Ind.), chairman of the House fossil fuels subcommittee, is the principal proponent of actual drawdowns and sales of SPR crude to test the mechanical and bureaucratic apparatus involved.

He says the drawdown, distribution, and sale of some SPR oil would give "the public and our allies confidence that the SPR works."

"But even more importantly, it would test in a noncrisis environment the complex business instruments that such a sale would require."

Auction system. If the SPR is to be used, the Energy Department plan calls for the President to decide when and at what rate.

DOE ruled out using a trigger or formula to begin the drawdowns automatically "because of the wide range of unpredictable conditions which might characterize an energy supply interruption."

DOE also said, "Use of the SPR will be part of a total interruption response, and the extent of its use is likely to change throughout the course of an interruption."

In an emergency, any oil under contract for delivery to the SPR or in transit is considered to be SPR oil.

The crude will be used "to provide additional supplies of petroleum to domestic energy markets on a timely basis, and to substitute for supplies interdicted due to a major fuel supply disruption."

DOE would move the crude to terminals or other delivery points, where title will transfer to recipients, who would assume responsibility for moving the oil to refineries.

The main method of SPR oil sales will

SPR crude-oil inventory

Storage site	Million bbl stored 1-1-84			Million bbl Store 1-1-1984
	Sour	Sweet	Total	
Bryan Mound	81.4	64.4	145.8	104.2
West Hackberry	35.7	50.3	86.0	56.9
Bayou Choctaw	26.8	18.3	45.1	44.5
Weeks Island	72.3	0	72.3	72.6
Sulphur Mines	26.0	0	26.0	13.2
Tanks and Pipelines	2.7	1.2	3.9	2.4
Total	244.9	134.2	379.1	293.8

Source: Energy Department



WEEKS Island Dravo worksite.

be by open price bidding.

The Energy Secretary will establish a minimum acceptable price.

Buyers, as a condition to bidding, will be required to sign a standard sales agreement.

This agreement will include measures to assure the financial and performance capabilities of the successful buyers.

DOE would make the list of eligible buyers as large as possible to insure efficient distribution of the crude.

The plan gives the Energy Secretary power to direct the distribution of up to 10% of the SPR oil sold in that calendar month.

"The price for such SPR oil will be the average price of SPR oil sold at the contemporaneous competitive sale, or at the most recent competitive sale if no contemporaneous competitive sale is held."

Emergency preparedness. A parallel issue is the state of the nation's energy emergency preparedness.

President Reagan vetoed legislation which would give him standby price and allocation controls, and the power to override such laws passed by state and local governments.

The administration wants to let the free market price and distribute supplies

during energy emergencies.

Proponents of legislation say existing federal powers are too few and too fragmented.

At the most, the administration only wants powers to preempt only state and local laws and regulations which, during a declared energy emergency, interfere with the domestic marketplace to aggravate the emergency.

The American Petroleum Institute has urged the passage of such override legislation, and says antitrust and conflict-of-interest laws should be changed to permit oil companies to help and advise the government during shortages.

Most analysts, in and out of Congress, have agreed that the oil shortages of 1973 and 1979 would have been less disruptive than they were, had the price and allocation regulations had not been in effect.

But Congress doesn't fully share the administration's assumption that a free market response is adequate for shortages of all severities, and many members have pressed DOE for more aggressive precrisis planning—especially concerning the allocation of crude and products.

Unprecedented stocks. No country in the world ever has had a strategic

petroleum reserve as large as the SPR.

Charles DiBona, president of the American Petroleum Institute, has said "We might wish that the development of the reserve had proceeded more rapidly, but it must be remembered that underground storage on the scale already in place, much less as contemplated in the future, is unprecedented in the world."

He pointed out the U.S. had no petroleum cushion at all during the Iranian crisis of 1979.

"Since a total denial of imports is unlikely, and other market adjustments tend to offset a supply shortfall, a SPR of any given size will provide relief from an interruption in supply for a much longer period than might be inferred simply by comparing it against the level of imports."

DiBona said use of the SPR "must be viewed within the context of an overall government approach to energy emergency response."

"A supply disruption will cause inconvenience and economic loss to the nation as a whole. There is no avoiding this—the task is to minimize it."

And the SPR will be a great minimizer.

Worldwide production statistics

NORTH AMERICA

Upper figures = 1,000 b/d
Lower figures = million t/y

	1940	1950	1960	1965	1970	1975	1976	1977	1978	1979	1980	1981	1982	1983
Canada	23.5 1.2	79.6 4.0	525.6 26.2	801.4 39.9	1,263.6 62.9	1,426.0 71.0	1,335.0 66.5	1,321.0 65.8	1,324.0 65.9	1,496.0 74.5	1,412.0 70.3	1,287.0 63.9	1,233.0 61.2	1,396.0 69.8
United States	3,707.4 184.6	5,407.1 269.3	7,054.6 351.3	7,804.1 388.6	9,630.0 479.6	8,374.0 417.0	8,132.0 405.0	8,245.0 410.6	8,701.0 433.3	8,544.0 425.4	8,569.0 426.7	8,588.0 426.3	8,655.0 429.6	8,669.0 433.2
Total	3,730.9 185.8	5,486.7 273.3	7,580.2 377.5	8,605.5 428.5	10,893.6 542.5	9,800.0 488.0	9,467.0 471.5	9,566.0 476.4	10,025.0 499.2	10,040.0 499.9	9,981.0 497.0	9,875.0 490.2	9,888.0 490.8	10,065.0 503.0

MIDDLE EAST

Upper figures = 1,000 b/d
Lower figures = million t/y

	1940	1950	1960	1965	1970	1975	1976	1977	1978	1979	1980	1981	1982	1983
Abu Dhabi	...	...	...	281.9 14.0	693.8 34.6	1,403.0 69.9	1,590.0 79.2	1,680.0 83.7	1,450.0 72.2	1,464.0 72.9	1,350.0 67.2	1,145.0 56.8	883.0 43.8	757.0 37.8
Bahrain	19.3 0.9	30.2 1.5	45.1 2.2	57.0 2.8	76.6 3.8	61.0 3.0	58.0 2.9	54.0 2.7	56.0 2.8	51.0 2.5	48.0 2.4	44.0 2.2	45.0 2.2	41.0 2.0
Dubai	...	...	...	...	...	254.0 12.6	315.0 15.7	320.0 15.9	360.0 17.9	354.0 17.6	349.0 17.4	358.0 17.8	357.0 17.7	327.0 16.3
Iran	181.2 9.0	664.3 33.1	1,067.6 53.2	1,885.5 93.9	3,328.8 165.8	5,350.1 266.4	5,882.9 293.0	5,662.8 282.0	5,241.7 261.0	3,101.0 154.4	1,467.0 73.0	1,375.0 68.2	1,896.0 94.1	2,606.0 130.2
Iraq	60.7 3.0	136.2 6.8	1,004.2 50.0	1,315.2 65.5	1,548.6 77.1	2,261.7 112.6	2,415.4 120.3	2,348.2 116.9	2,562.0 127.6	3,434.0 171.0	2,638.0 131.3	892.0 44.3	914.0 45.4	905.0 45.2
Israel	...	...	2.5 0.1	4.0 0.2	70.2 3.5	75.0 3.7	0.7 ...	0.7 ...	10.0 0.5	31.0 1.5	1.0 ...	0.3 ...	0.3 ...	0.2 ...
Kuwait	...	344.4 17.1	1,628.2 81.1	2,169.5 108.0	2,734.5 136.2	1,837.0 91.5	1,913.0 95.3	1,783.0 88.8	1,865.0 92.9	2,213.0 110.2	1,382.0 68.8	916.0 45.5	675.0 33.5	912.0 45.6
Neutral Zone	...	...	136.2 6.8	360.9 18.0	500.6 24.9	496.0 24.7	471.0 23.5	355.0 17.7	466.0 23.2	567.0 28.2	540.0 26.9	370.0 18.4	315.0 15.6	398.0 19.9
Oman	...	...	...	...	332.4 16.6	341.0 17.0	366.0 18.2	350.0 17.4	320.0 15.9	295.0 14.7	283.0 14.1	317.0 15.7	328.0 16.2	378.0 18.9
Qatar	...	33.6 1.7	175.1 8.7	231.1 11.5	362.4 18.0	437.6 21.8	497.6 24.8	444.6 22.1	486.7 24.2	504.0 25.1	472.0 23.5	414.0 20.6	340.0 16.9	270.0 13.5
Saudi Arabia	13.9 0.7	546.7 27.2	1,247.1 62.1	2,024.9 100.8	3,548.9 176.7	6,827.0 340.0	8,344.0 415.5	9,014.0 448.9	8,059.0 401.3	9,251.0 460.6	9,630.0 479.5	9,642.0 478.6	6,484.0 321.9	4,872.0 243.4
Sharjah	...	...	...	...	...	38.0 1.9	37.0 1.8	30.0 1.5	24.0 1.2	13.0 0.6	10.0 0.5	9.0 0.5	7.0 0.3	35.0 1.7
Syria	...	...	...	...	83.1 4.1	175.0 8.7	175.0 8.7	200.0 10.0	170.0 8.5	163.0 8.1	165.0 8.2	166.0 8.2	175.0 8.7	165.0 8.2
Turkey	...	0.3 0.3	7.0 0.3	29.7 1.5	67.9 3.4	60.0 3.0	69.0 3.4	65.0 3.2	50.0 2.5	56.0 2.8	44.0 2.2	46.0 2.3	45.0 2.2	45.0 2.2
Total	275.1 13.6	1,755.7 87.4	5,313.0 264.5	8,359.7 416.2	13,347.8 664.7	19,616.4 976.8	22,134.6 1,102.3	22,307.3 1,110.8	21,120.4 1,051.7	21,486.0 1,070.3	18,378.0 915.0	15,694.3 778.1	12,464.3 618.7	11,711.2 585.3

*Totals may not add due to rounding.

WORLDWIDE PRODUCTION STATISTICS

EUROPE

Upper figures = 1,000 b/d
Lower figures = million t/y

	1940	1950	1960	1965	1970	1975	1976	1977	1978	1979	1980	1981	1982	1983
Austria	7.7 0.4	27.9 1.4	45.4 2.3	53.1 2.6	53.3 2.7	40.0 2.0	37.0 1.8	36.0 1.8	35.0 1.7	35.0 1.7	29.0 1.4	25.0 1.2	25.0 1.2	24.0 1.2
Denmark	...	...	...	...	...	3.0 0.1	3.0 0.1	9.0 0.4	10.0 0.5	8.0 0.4	6.0 0.3	16.0 0.8	38.0 1.9	46.0 2.3
France	1.4 0.1	2.5 0.1	38.6 1.9	59.5 3.0	45.8 2.3	20.0 1.0	20.0 1.0	20.0 1.0	21.0 1.0	20.0 1.0	26.0 1.3	34.0 1.7	33.0 1.6	32.0 1.6
Germany, Fed. Rep.	20.1 1.0	22.2 1.1	107.3 5.3	155.0 7.7	147.2 7.3	112.0 5.6	110.0 5.5	108.0 5.4	102.0 5.1	94.0 4.7	90.0 4.5	86.0 4.3	84.0 4.1	81.0 4.0
Greece	...	...	...	...	...	...	...	...	...	...	...	8.0 0.4	21.0 1.0	25.0 1.2
Italy	0.2 ...	0.2 ...	37.5 1.9	47.0 2.3	26.3 1.3	19.0 0.9	20.0 1.0	18.0 0.9	28.0 1.4	30.0 1.5	39.0 1.9	37.0 1.8	28.0 1.4	37.0 1.8
Netherlands	...	13.4 0.7	36.0 1.8	37.0 1.9	35.8 1.8	30.0 1.5	31.0 1.5	30.0 1.5	36.0 1.8	25.0 1.2	25.0 1.2	27.0 1.3	28.0 1.4	42.0 2.1
Norway	...	...	...	...	...	189.0 9.4	279.0 13.9	270.0 13.4	350.0 17.4	403.0 20.1	528.0 26.3	508.0 25.2	488.0 24.2	600.0 29.9
Spain	...	...	...	...	3.1 0.2	40.6 2.0	35.4 1.8	19.6 1.0	19.6 1.0	23.2 1.2	32.0 1.6	24.5 3.2	30.6 1.5	59.5 3.0
United Kingdom	...	0.9 ...	1.7 0.1	1.7 0.1	1.7 0.1	12.0 0.6	245.0 12.2	744.0 37.0	1,082.0 53.9	1,568.0 78.1	1,619.0 80.6	1,790.0 88.9	2,050.0 101.6	2,260.5 113.0
Total	29.7 1.5	67.1 3.3	266.5 13.2	353.3 17.5	313.7 15.6	461.0 22.9	785.0 38.9	1,256.0 62.3	1,664.0 82.6	2,198.0 109.1	2,392.0 118.7	2,555.0 126.8	2,825.0 140.2	3,206.5 160.3

ASIA-PACIFIC

Upper figures = 1,000 b/d
Lower figures = million t/y

	1940	1950	1960	1965	1970	1975	1976	1977	1978	1979	1980	1981	1982	1983
Afghanistan	...	...	...	...	...	...	0.2	0.2	0.2	...	...	...	...	...
Australia	...	...	...	7.2 0.4	175.6 8.7	411.0 20.5	417.0 20.8	431.0 21.5	430.0 21.4	441.0 22.0	379.0 18.9	382.0 19.0	353.0 17.5	405.0 20.2
Brunei	19.3 1.0	84.8 4.2	92.9 4.6	80.4 4.0	148.0 7.4	175.0 8.7	200.0 10.0	207.0 10.3	210.0 10.5	256.0 12.7	230.0 11.5	166.0 8.2	155.0 7.7	155.0 7.7
Burma	21.1 1.0	1.5 0.1	11.1 0.6	12.1 0.6	16.4 0.8	20.0 1.0	20.0 1.0	23.0 1.1	25.0 1.2	30.0 1.5	30.0 1.5	30.0 1.5	30.0 1.5	30.0 1.5
India	3.9 0.2	5.1 0.2	9.0 0.4	61.8 3.1	138.6 6.9	165.0 8.2	180.0 9.0	200.0 10.0	230.0 11.5	245.0 12.2	182.0 9.1	298.0 14.8	384.0 19.1	390.0 19.5
Indonesia	169.4 8.4	132.6 6.6	411.2 20.5	485.0 24.1	853.6 42.5	1,306.5 65.1	1,503.6 74.9	1,686.1 84.0	1,635.2 81.4	1,595.0 79.4	1,576.0 78.5	1,607.0 80.0	1,341.0 66.6	1,292.0 64.6
Japan	7.2 0.4	5.6 0.3	10.2 0.5	11.4 0.6	16.3 0.7	12.0 0.6	12.0 0.6	10.0 0.5	10.0 0.5	8.0 0.4	10.0 0.5	7.0 0.3	6.0 0.3	6.9 0.3
Malaysia	...	...	...	...	...	100.0 5.0	161.0 8.0	190.0 9.5	210.0 10.5	259.0 12.9	288.0 14.3	259.0 12.9	306.0 15.2	370.0 18.5
New Guinea	...	4.8 0.2	4.2 0.2	...	...	...	...	...	...	...	...	...	...	...
New Zealand	...	...	...	...	...	...	10.0 0.5	15.0 0.7	13.0 0.6	9.0 0.4	7.0 0.3	10.0 0.5	15.0 0.7	15.0 0.7
Pakistan	2.4 0.1	3.5 0.2	7.2 0.4	11.2 0.6	9.9 0.5	6.0 0.3	7.0 0.3	10.0 0.5	9.3 0.5	10.0 0.5	10.0 0.5	10.0 0.5	12.0 0.6	13.0 0.6
Philippines	...	...	...	...	...	...	...	...	...	26.0 1.3	15.0 0.7	2.0 0.1	7.0 0.3	15.0 0.7
Taiwan	...	...	0.4	0.4	1.8 0.1	5.0 0.2	4.2 0.2	5.0 0.2	4.3 0.2	5.0 0.2	5.0 0.2	3.0 0.1	3.0 0.1	2.3 0.1
Thailand	...	...	...	...	0.4	0.2	0.3	0.2	0.2	...	...	...	6.0 0.3	11.0 0.5
Total	223.3 11.1	237.9 11.8	546.2 27.2	669.5 33.4	1,360.6 67.7	2,200.7 109.6	2,515.3 125.3	2,777.5 138.3	2,777.2 138.3	2,883.0 143.5	2,732.0 136.0	2,234.0 110.9	2,618.0 129.9	2,705.2 135.2

WORLDWIDE PRODUCTION STATISTICS

LATIN AMERICA

Upper figures = 1,000 b/d
Lower figures = million t/y

	1940	1950	1960	1965	1970	1975	1976	1977	1978	1979	1980	1981	1982	1983
Argentina	56.3 2.8	64.0 3.2	171.9 8.6	269.3 13.4	382.9 19.1	396.0 19.7	398.0 19.8	431.0 21.5	453.0 22.6	467.0 23.3	487.0 24.2	497.0 24.7	483.0 24.0	481.0 24.0
Bolivia	0.8 ...	1.7 0.1	9.8 0.5	9.2 0.5	16.3 0.8	42.0 2.1	41.0 2.0	35.0 1.7	30.0 1.5	30.0 1.5	30.0 1.5	24.0 1.2	24.0 1.2	22.0 1.1
Brazil	...	0.9 ...	80.9 4.0	94.0 4.7	160.5 8.0	174.0 8.7	171.0 8.5	162.0 8.1	160.0 8.0	161.0 8.0	182.0 9.1	215.0 10.7	252.0 12.5	315.0 15.7
Chile	...	1.7 0.1	19.8 1.0	34.9 1.7	34.6 1.7	25.0 1.2	24.0 1.2	22.0 1.1	20.7 1.0	23.0 1.1	29.0 1.4	40.0 2.0	41.0 2.0	39.0 1.9
Colombia	69.9 3.5	93.3 4.6	152.7 7.6	210.0 10.0	214.0 10.7	160.0 8.0	147.0 7.3	140.0 7.0	130.0 6.5	124.0 6.2	125.0 6.2	125.0 6.2	140.0 6.9	155.0 7.7
Ecuador	6.4 0.3	7.2 0.4	7.7 0.4	8.0 0.4	4.1 0.2	160.9 8.0	187.8 9.3	183.4 9.1	201.8 10.0	225.0 11.2	222.0 11.1	204.0 10.1	215.0 10.7	236.0 11.8
Guatemala	...	...	...	...	...	...	...	...	...	2.0 0.1	5.0 0.2	5.0 0.2	6.4 0.3	7.5 0.3
Mexico	120.3 6.0	198.5 9.9	270.6 13.5	323.1 16.1	430.2 21.4	806.0 40.1	894.0 44.5	981.0 48.8	1,207.0 60.1	1,461.0 72.7	1,936.0 96.4	2,390.0 118.6	2,734.0 135.7	2,702.0 135.0
Peru	33.2 1.6	41.1 2.0	52.6 2.6	63.2 3.1	72.2 3.6	73.0 3.6	75.0 3.7	90.0 4.5	150.0 7.5	195.0 9.7	191.0 9.5	184.0 9.1	198.0 9.8	171.0 8.5
Trinidad & Tobago	60.9 3.0	56.5 2.8	115.7 5.8	133.9 6.7	139.8 7.0	205.0 10.2	224.0 11.2	230.0 11.5	240.0 12.0	215.0 10.7	211.0 10.5	240.0 11.9	182.0 9.0	158.0 7.9
Venezuela	507.0 25.2	1,498.0 74.6	2,846.1 141.7	3,472.9 172.9	3,708.0 184.7	2,346.2 116.8	2,294.4 114.3	2,237.9 111.4	2,165.5 107.8	2,356.0 117.3	2,167.0 107.9	2,093.0 103.9	1,826.0 90.6	1,791.0 89.5
Others	...	...	...	...	...	...	...	...	...	...	...	...	0.6 ...	0.5 ...
Total	854.8 42.4	1,962.9 97.7	3,727.8 185.7	4,609.5 229.5	5,162.6 257.2	4,388.1 218.4	4,456.4 221.8	4,512.3 224.7	4,758.0 237.0	5,259.0 261.8	5,588.0 278.1	6,017.0 298.7	6,102.0 302.9	6,078.0 303.7
Total non-Communist	5,131.9 255.3	9,556.0 474.4	17,716.7 878.8	24,809.4 1,231.5	37,047.7 1,838.0	41,539.8 2,062.0	45,223.9 2,244.9	46,896.8 2,318.0	46,388.8 2,301.6	48,515.0 2,408.3	42,417.3 2,105.6	40,735.5 2,022.1	38,352.0 1,903.8	38,314.0 1,914.7

AFRICA

Upper figures = 1,000 b/d
Lower figures = million t/y

	1940	1950	1960	1965	1970	1975	1976	1977	1978	1979	1980	1981	1982	1983
Algeria	...	...	182.7 9.1	551.6 27.5	1,029.1 51.2	982.6 48.9	1,075.1 53.5	1,152.3 57.4	1,161.2 57.8	1,175.0 58.5	1,016.0 50.6	750.0 37.2	750.0 37.2	686.6 34.3
Angola (inc. Cabinda) ..	...	...	1.3 0.1	13.0 0.6	13.7 0.7	166.0 8.3	108.0 5.4	195.0 9.7	130.0 6.5	147.0 7.3	150.0 7.5	140.0 6.9	122.0 6.1	174.0 8.7
Cameroon	...	...	...	...	...	...	...	...	10.0 0.5	34.0 1.7	58.0 2.9	87.0 4.3	109.0 5.4	114.0 5.7
Congo	...	...	...	...	...	38.0 1.9	39.0 1.9	35.0 1.7	28.0 1.4	57.0 2.8	56.0 2.8	79.0 3.9	87.0 4.3	95.0 4.7
Egypt	18.1 0.9	44.9 2.2	61.6 3.1	122.7 6.1	327.3 16.3	230.0 11.5	328.0 16.3	413.0 20.6	464.0 23.1	526.0 26.2	596.0 29.7	578.0 28.7	667.0 33.1	690.0 34.5
Gabon	...	...	16.1 0.8	25.2 1.3	108.8 5.4	223.0 11.1	222.8 11.1	222.0 11.1	208.7 10.4	204.0 10.2	180.0 9.0	147.0 7.3	130.0 6.5	150.0 7.5
Libya	...	...	...	1,220.0 60.8	3,318.0 165.2	1,479.8 73.7	1,932.6 96.2	2,063.4 102.8	1,982.5 98.7	2,066.0 102.9	1,785.0 88.9	1,063.0 52.8	1,127.0 55.9	1,020.0 51.0
Ivory Coast	...	...	...	...	...	...	...	...	...	...	...	7.0 0.3	9.0 0.4	24.0 1.2
Nigeria	...	...	17.3 0.9	272.2 13.6	1,083.3 53.9	1,783.2 88.8	2,066.8 102.9	2,085.1 103.8	1,897.0 94.5	2,303.0 114.7	2,057.0 102.4	1,369.0 68.0	1,324.0 65.7	1,232.0 61.6
Tunisia	...	...	3.0 0.1	3.6 0.2	87.7 4.4	95.0 4.7	73.0 3.6	87.0 4.3	100.0 5.0	100.0 5.0	110.0 5.5	118.0 5.8	106.0 5.3	115.0 5.7
Zaire	...	...	...	...	...	...	20.0 1.0	24.0 1.2	20.0 1.0	21.0 1.0	20.0 1.0	20.0 1.0	22.0 1.1	26.0 1.3
Others	...	0.8 ...	3.0 0.1	3.6 0.2	1.5 0.1	0.7 0.1	0.1 ...	0.4 ...	0.1 ...	5.0 0.2	4.0 0.2	9.2 0.5	10.7 0.5	6.6 0.3
Total	18.1 0.9	45.7 2.2	285.0 14.2	2,211.9 110.3	5,969.4 297.2	4,998.3 248.9	5,865.4 291.9	6,277.2 312.6	6,001.5 298.9	6,637.0 330.5	6,032.0 300.3	4,360.2 216.4	4,454.7 221.1	4,548.8 227.3



COMMUNIST AREAS

Upper figures = 1,000 b/d
Lower figures = million t/y

	1940	1950	1960	1965	1970	1975	1976	1977	1978	1979	1980	1981	1982	1984
Bulgaria	...	...	4.0 0.2	4.6 0.2	6.7 0.3	2.4 0.1	2.4 0.1	2.6 0.1	5.1 0.3	5.3 0.3	6.0 0.1	6.0 0.1	3.0 0.1	3.0 0.1
China	...	4.0 0.2	100.0 5.0	220.0 11.0	500.0 24.9	1,542.0 76.8	1,736.0 86.5	1,874.0 93.3	2,090.4 104.1	2,130.5 106.1	2,119.0 105.9	2,024.4 101.2	2,042.0 102.1	2,100.0 105.0
Czechoslovakia	...	0.8 ...	2.7 0.1	3.9 0.2	4.1 0.2	2.8 0.1	2.6 0.1	2.5 0.1	2.3 0.1	2.2 0.1	1.9 0.1	1.7 0.1	2.0 0.1	2.0 0.1
German Dem. Rep.	...	1.0 ...	1.0 ...	1.0 ...	1.2 0.1	4.0 0.2	10.0 0.5	10.0 0.5	10.0 0.5	10.0 0.5	10.0 0.5	10.0 0.5	10.0 0.5	10.0 0.5
Hungary	...	10.1 0.5	24.3 1.2	36.1 1.8	38.7 1.9	40.1 2.0	43.0 2.1	44.0 2.2	44.1 2.2	40.7 2.0	40.6 2.0	40.5 2.0	41.0 2.0	40.0 2.0
Poland	...	3.3 0.2	3.9 0.2	6.8 0.3	8.5 0.4	11.1 0.6	9.1 0.5	7.3 0.4	7.3 0.4	6.6 0.3	6.6 0.3	6.0 0.3	4.0 0.2	4.0 0.2
Romania	...	87.7 4.4	231.0 11.5	252.4 12.6	268.6 13.4	293.0 14.6	295.2 14.7	294.2 14.7	275.6 13.7	247.0 12.3	230.9 11.5	232.0 11.6	234.0 11.7	255.0 12.7
U.S.S.R.*	624.9 31.1	760.6 37.9	2,969.1 147.9	4,877.3 242.9	7,089.2 353.0	9,855.5 490.8	10,435.3 519.7	10,959.8 545.8	11,476.6 571.5	11,758.5 585.6	12,031.0 603.2	12,180.0 609.0	12,260.0 613.0	12,326.0 616.3
Yugoslavia	0.3 ...	2.1 0.1	18.8 0.9	407 2.0	57.8 2.9	75.0 3.7	77.5 3.9	79.0 3.9	82.0 4.1	70.0 3.5	84.5 4.2	87.6 4.4	87.0 4.3	82.0 4.1
Others	...	2.7 0.1	14.9 0.7	19.0 0.9	37.1 1.8	36.6 1.8	50.0 2.5	50.0 2.5	50.0 2.5	50.0 2.5	50.0 2.5	57.2 2.9	81.0 4.0	94.0 4.7
Total	625.2 31.1	872.3 43.3	3,369.7 167.3	5,461.8 271.1	8,011.8 397.7	11,787.5 585.1	12,661.1 629.5	13,323.4 661.4	14,043.4 697.1	14,320.8 710.9	14,580.0 730.5	14,645.4 732.3	14,764.0 738.0	14,916.0 745.7
*Includes gas liquids														
World Total	5,757.1 286.4	10,428.3 519.1	21,086.4 1,050.1	30,271.2 1,507.4	45,059.6 2,243.9	53,327.3 2,655.3	57,885.0 2,882.4	60,020.0 2,968.7	60,410.2 3,008.4	62,835.8 3,128.7	56,997.3 2,829.3	55,380.9 2,757.7	53,116.0 2,641.8	53,230.0 2,660.4

World oil consumption

Upper figures = 1,000 b/d Lower figures = million t/y							
	1980	1981	1982		1980	1981	1982
U.S.A.	16,390 791.4	15,675 746.0	14,905 703.0	Switzerland	270 12.8	250 11.9	235 11.2
Canada	1,855 87.5	1,760 81.7	1,580 73.0	United Kingdom	1,675 80.6	1,555 74.7	1,580 75.6
Total North America	18,245 878.9	17,435 827.7	16,485 776.0	Yugoslavia.....	300 15.1	285 14.4	280 14.1
Latin America	4,610 222.1	4,725 227.2	4,900 235.4	Other	390 19.2	355 17.3	375 18.4
Total Western Hemisphere	22,855 1,101.0	22,160 1,054.9	21,385 1,011.4	Total Western Europe.....	14,015 682.5	13,045 632.5	12,455 601.1
Austria	245 12.1	225 11.0	215 10.5	Middle East.....	1,630 82.0	1,685 84.7	1,720 86.7
Belgium & Luxembourg.....	545 27.0	500 24.5	465 22.8	Africa	1,485 71.9	1,565 75.9	1,635 79.0
Denmark	265 13.2	260 12.8	240 11.7	South Asia	785 38.4	890 43.4	925 45.1
Finland	255 12.8	245 12.3	230 11.3	Southeast Asia.....	2,445 121.6	2,480 123.3	2,435 121.0
France	2,295 111.1	2,060 99.0	1,935 92.4	Japan	5,010 240.9	4,690 223.9	4,380 207.0
Germany, Fed. Rep.	2,735 131.1	2,465 117.6	2,360 112.4	Australasia	775 36.5	760 35.8	755 35.5
Greece	250 12.5	240 11.9	245 11.9	U.S.S.R.	8,820 436.0	8,985 444.1	9,075 448.5
Ireland	120 5.7	110 5.2	95 4.6	Eastern Europe	2,115 102.6	2,110 102.4	2,085 101.1
Italy.....	1,985 98.1	1,940 95.7	1,845 90.7	China.....	1,770 88.0	1,705 84.8	1,660 82.4
Netherlands.....	815 39.2	735 35.7	640 30.4	Total Eastern Hemisphere	38,850 1,900.4	37,915 1,850.8	37,125 1,807.4
Norway	185 8.2	155 7.5	160 7.6	World excl. U.S.S.R. China & E. Europe	49,000 2,374.8	47,275 2,274.4	45,690 2,186.8
Portugal.....	170 8.5	180 8.8	185 9.1	World Total	61,705 3,001.4	60,075 2,905.7	58,510 2,818.8
Spain	1,040 50.7	1,040 50.4	970 46.5	Source: British Petroleum South Asia—Afghanistan, Bangladesh, Burma, India, Pakistan, Sri Lanka Southeast Asia—Brunei, Malaysia, Kampuchea, Indonesia, Hong Kong, Korea, Laos, Philippines, Singapore, Thailand, Taiwan, Viet Nam Australasia—Australia, Papua New Guinea, New Zealand, SW Islands			
Sweden	495 24.6	445 21.8	400 19.7				

Worldwide refining capacity

EUROPE														
Upper figures = 1,000 b/d Lower figures = million t/y														
	1940	1950	1960	1970	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984
Austria	...	26 1.3	47 2.3	98 4.9	220 11.0	280 13.9	280 13.9	280 13.9	280 13.9	280 13.9	280 13.9	244 12.1	269 13.4	268 13
Belgium	12 0.6	16 0.8	171 8.5	699 34.8	867 43.2	946 47.1	1,095 54.5	1,067 53.1	972 48.4	1,064 53.0	1,056 52.6	1,035 51.4	693 34.4	694 34.6
Cyprus	...	...	...	...	15 0.7	15 0.7	15 0.7	15 0.7	15 0.7	16 0.8	16 0.8	14 0.7	16 0.8	15 0.7
Denmark	1 ...	1 ...	...	173 8.6	220 11.0	226 11.3	226 11.3	220 11.0	215 10.7	214 10.7	215 10.7	215 10.7	215 10.7	174 0.9
Finland	...	...	25 1.2	176 8.8	196 9.8	336 16.7	336 16.7	336 16.7	336 16.7	336 16.7	336 16.7	299 14.8	299 14.8	299 14.8
France	152 7.6	306 15.2	769 38.3	2,405 119.8	3,342 166.4	3,312 164.9	3,517 175.1	3,456 172.1	3,469 172.6	3,385 168.6	3,342 166.4	3,291 163.4	2,471 142.5	2,670 133.0
Germany, Fed. Rep.	48 2.4	81 4.0	573 28.5	2,351 117.1	2,987 148.8	3,103 154.5	3,075 153.1	3,081 153.4	3,103 154.5	2,986 148.7	3,021 150.4	2,937 145.8	2,471 122.7	2,386 118.8
Greece	...	...	30 1.5	95 4.7	411 20.5	420 20.9	407 20.3	407 20.3	411 20.5	431 21.5	428 21.3	427 21.2	422 20.9	369 18.4
Ireland	11 0.5	...	40 2.0	54 2.7	56 2.8	56 2.8	56 2.8	56 2.8	56 2.8	56 2.8	56 2.8	56 2.8	56 2.8	56 2.8
Italy	41 2.0	107 5.3	773 38.5	3,214 160.5	3,953 196.9	4,082 203.3	4,259 212.1	4,226 210.4	4,196 209.0	4,131 205.7	4,092 203.7	4,003 198.7	3,283 163.0	3,050 151.9
Netherlands	15 0.7	77 3.8	359 17.9	1,456 72.5	1,841 91.7	1,985 98.6	2,031 101.1	1,869 93.1	1,857 92.5	1,828 91.0	1,827 91.0	1,708 84.8	1,552 77.0	1,552 77.0
Norway	1 ...	1 ...	2 0.2	113 5.6	168 8.4	259 12.9	259 12.9	264 13.1	264 13.1	264 13.1	253 12.6	243 12.1	243 12.1	243 12.1
Portugal	4 0.2	8 0.4	23 1.1	82 4.1	110 5.5	190 9.5	190 9.5	415 20.7	361 18.0	378 18.8	341 17.0	365 18.1	365 18.1	282 14.0
Spain	11 0.5	17 0.8	144 7.2	734 36.7	1,172 58.6	1,223 61.1	1,242 62.1	1,282 64.1	1,392 69.6	1,442 72.1	1,442 72.1	1,442 72.1	1,442 72.1	1,442 72.1
Sweden	4 0.2	26 1.3	48 2.4	253 12.6	248 12.4	413 20.6	434 21.6	424 21.1	411 20.5	458 22.8	451 22.5	471 23.4	453 22.5	453 22.5
Switzerland	...	...	...	106 5.3	138 6.9	138 6.9	137 6.8	137 6.8	137 6.8	137 6.8	102 5.1	137 6.8	137 6.8	137 6.8
United Kingdom	133 6.6	197 9.8	962 47.9	2,420 120.5	2,783 138.6	2,889 143.9	3,014 150.5	2,911 145.0	2,527 125.8	2,527 125.8	2,629 130.9	2,482 123.2	2,260 112.1	2,092 104.2
Yugoslavia	5 0.2	8 0.4	10 0.5	228 11.3	288 14.3	280 13.9	249 12.4	293 14.5	293 14.6	296 14.7	297 14.8	297 14.8	297 14.8	297 14.8
Total Europe	429 21.1	860 42.6	3,978 198.1	14,651 729.6	19,008 946.9	20,253 1,008.5	20,857 1,038.5	20,728 1,032.1	20,328 1,012.1	20,243 1,007.9	20,206 1,006.1	19,741 979.9	17,424 867.6	16,530 814.9

REFINING CAPACITY STATISTICS

U.S.S.R.-EASTERN EUROPE-CHINA

Upper figures = 1,000 b/d
Lower figures = million t/y

	1940	1950	1960	1970	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984
China	...	8 0.4	98 4.9	300 14.9	850 42.3	1,014 50.5	1,398 69.6	1,400 69.7	1,578 78.6	1,600 79.7	1,810 90.1	1,810 90.1	2,000 100.0	2,050 102.1
Czechoslovakia	...	16 0.8	46 2.3	220 11.0	354 17.6	374 18.6	404 20.1	413 20.6	445 22.2	455 22.7	455 22.7	455 22.7	455 22.7	455 22.7
Hungary	...	20 1.0	58 2.9	130 6.5	212 10.6	223 11.1	230 11.5	226 11.3	230 11.5	290 14.4	312 15.5	312 15.5	311 15.5	312 15.6
Poland	...	4 0.2	20 1.0	156 7.8	280 13.9	326 16.2	366 18.2	370 18.4	380 18.9	385 19.2	385 19.2	385 19.2	385 19.2	385 19.2
Romania	...	182 9.1	260 12.9	356 17.7	452 22.5	462 23.0	490 24.4	508 25.3	533 26.5	608 30.3	617 30.7	617 30.7	617 30.8	617 30.8
U.S.S.R.	...	900 44.8	2,800 139.4	5,640 280.9	8,240 410.3	9,225 459.4	9,500 473.1	9,785 487.3	10,478 521.8	10,950 545.3	11,400 567.6	11,600 575.8	11,750 587.5	12,000 597.5
Others	...	4 0.2	40 2.0	332 16.5	375 18.7	726 36.1	800 39.8	810 40.3	823 41.0	852 42.4	852 42.4	852 42.4	898 44.7	852 42.4
Total	...	1,134 56.5	3,322 165.4	7,134 355.3	10,763 535.9	12,350 614.9	13,188 656.7	13,512 672.9	14,467 720.5	15,140 754.0	15,831 788.2	16,031 795.8	16,416 817.4	16,871 830.3
World total	6,608 328.3	11,647 579.5	24,470 1,218.3	49,212 2,449.9	68,228 3,397.7	71,799 3,575.0	74,868 3,728.0	76,184 3,793.3	78,169 3,892.3	79,515 3,959.2	81,379 4,039.7	81,396 4,040.5	77,145 3,841.5	75,137 3,733.0

MIDDLE EAST

Upper figures = 1,000 b/d
Lower figures = million t/y

	1940	1950	1960	1970	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984
Abu Dhabi*	...	...	...	...	...	...	...	...	...	...	14 0.7	128 6.3	135 6.7	185 9.2
Bahrain	33 1.6	150 7.5	187 9.3	265 13.2	250 12.4	250 12.4	250 12.4	250 12.4	250 12.4	250 12.4	250 12.4	250 12.4	250 12.4	250 12.4
Iran	333 16.6	502 25.0	495 24.6	702 35.0	789 39.3	781 38.9	780 38.8	910 45.3	921 45.9	921 45.9	1,121 55.8	530 26.3	530 26.3	530 26.3
Iraq	4 0.2	9 0.4	56 2.8	83 4.1	169 8.4	169 8.4	168 8.4	168 8.4	168 8.4	168 8.4	168 8.4	169 8.4	169 8.4	169 8.4
Israel	...	83 4.1	87 4.3	115 5.7	201 10.0	181 9.0	201 10.0	201 10.0	195 9.7	195 9.7	190 9.5	190 9.5	190 9.5	190 9.5
Jordan*	...	...	...	...	...	...	...	...	...	...	36 1.8	91 4.5	100 5.0	100 5.0
Kuwait*	...	25 1.2	270 13.4	569 28.3	646 32.2	685 34.1	684 34.1	712 35.5	712 35.5	645 32.1	645 32.1	623 30.9	623 30.9	623 30.9
Lebanon	...	6 0.3	24 1.2	37 1.8	54 2.7	54 2.7	...	53 2.6	53 2.6	53 2.6	52 2.6	52 2.6	52 2.6	52 2.6
Oman*	...	...	...	...	...	...	...	...	...	...	...	...	46 2.3	48 2.4
Qatar*	...	...	...	...	...	...	...	...	...	...	13 0.6	13 0.6	12 0.6	63 3.1
Saudi Arabia	...	140 7.0	189 9.4	465 23.2	610 30.4	537 26.7	630 31.4	586 29.2	487 24.2	487 24.2	487 24.2	487 24.2	705 35.0	860 42.8
Syria	...	...	...	54 2.7	51 2.5	117 5.8	116 5.8	102 5.1	223 11.1	223 11.1	223 11.1	223 11.1	229 11.4	229 11.4
Turkey	...	1 ...	7 0.3	209 10.4	316 15.7	316 15.7	325 16.2	326 16.2	338 16.8	356 17.7	356 17.7	367 18.2	467 23.1	472 23.5
South Yemen	...	...	120 6.0	178 8.9	169 8.4	169 8.4	169 8.4	143 7.1	143 7.1	175 8.7	175 8.7	178 8.8	178 8.8	130 6.5
Others	...	...	1 ...	9 0.4	28 1.4	29 1.4	48 2.4	55 2.7	56 2.8	45 2.2	...	...	...	...
Total	370 18.4	916 45.5	1,436 71.4	2,686 133.7	3,283 163.4	3,286 163.5	3,371 167.9	3,506 174.5	3,546 176.5	3,518 175.0	3,731 185.8	3,502 183.9	3,685 182.9	3,901 194.3

*Prior to 1981, included in others.
†Includes Neutral Zone.

REFINING CAPACITY STATISTICS

LATIN AMERICA

Upper figures — 1,000 b/d
Lower figures — million t/y

	1940	1950	1960	1970	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984
Argentina	103 5.1	152 7.6	238 11.9	502 25.0	721 35.9	684 34.1	703 35.0	655 32.6	655 32.6	676 33.7	679 33.8	677 33.6	676 33.5	678 33.8
Bahamas	...	...	...	...	500 24.9	500 24.9	500 24.9	500 24.9	500 24.9	500 24.9	500 24.9	500 24.9	500 24.9	500 24.9
Barbados	...	...	...	3 0.1	3 0.1	3 0.1	3 0.1	3 0.1	3 0.1	3 0.1	3 0.1	3 0.1	3 0.1	3 0.1
Bolivia	1 ...	7 0.3	12 0.6	21 1.0	26 1.3	34 1.7	37 1.8	40 2.0	74 3.7	74 3.7	74 3.7	61 3.0	61 3.0	47 2.3
Brazil	4 0.2	12 0.6	156 7.8	575 28.6	962 47.9	986 49.1	1,118 55.7	1,161 57.8	1,209 60.2	1,205 60.0	1,402 69.8	1,407 69.8	1,219 60.5	1,301 64.8
Chile	1 ...	4 0.2	24 1.2	115 5.7	124 6.2	149 7.4	140 7.0	130 6.5	144 7.2	139 6.9	139 6.9	141 7.0	141 7.0	141 7.0
Colombia	15 0.7	24 1.2	51 2.5	140 7.0	172 8.6	172 8.6	165 8.2	165 8.2	174 8.7	193 9.5	199 9.9	199 9.9	214 10.6	211 10.5
Costa Rica	...	...	...	8 0.4	11 0.5	8 0.4	8 0.4	10 0.5	12 0.6	11 0.5	15 0.7	15 0.7	16 0.8	17 0.8
Cuba	4 0.2	7 0.3	87 4.3	93 4.6	122 6.1	122 6.1	122 6.1	122 6.1	160 8.0	160 8.0	160 8.0	160 8.0	160 8.0	160 8.0
Ecuador	2 0.1	5 0.2	7 0.3	37 1.8	44 2.2	44 2.2	41 2.0	96 4.8	93 4.6	86 4.3	87 4.3	90 4.3	79 3.9	84 4.2
El Salvador	...	...	...	14 0.7	14 0.7	16 0.8	16 0.8	17 0.8	17 0.8	16 0.8	16 0.8	16 0.8	16 0.8	16 0.8
Guatemala	...	...	...	21 1.0	26 1.3	25 1.2	14 0.7	14 0.7	14 0.7	16 0.8	16 0.8	16 0.8	16 0.8	16 0.8
Honduras	...	...	...	10 0.5	15 0.7	14 0.7	14 0.7	14 0.7	14 0.7	14 0.7	14 0.7	14 0.7	14 0.7	14 0.7
Jamaica	...	...	...	28 1.4	33 1.6	33 1.6	33 1.6	33 1.6	33 1.6	34 1.7	22 1.1	22 1.1	36 1.8	36 1.8
Mexico	98 4.9	160 8.0	357 17.8	515 25.6	760 37.8	760 37.8	935 46.6	1,384 68.9	1,244 61.9	1,394 69.4	1,394 69.4	1,470 73.0	1,289 64.0	1,269 63.2
Netherlands Antilles	495 24.6	617 30.7	680 33.9	795 39.6	900 44.8	849 42.3	810 40.3	842 41.9	842 41.9	792 39.4	782 38.9	782 38.9	782 38.9	740 36.8
Nicaragua	...	...	...	21 1.0	13 0.6	13 0.6	15 0.7	15 0.7	15 0.7	14 0.7	14 0.7	14 0.7	14 0.7	15 0.7
Panama	...	...	...	140 7.0	100 5.0	100 5.0	100 5.0	100 5.0	100 5.0	100 5.0	100 5.0	100 5.0	100 5.0	100 5.0
Paraguay	...	...	...	5 0.2	5 0.2	5 0.2	5 0.2	5 0.2	5 0.2	7 0.4	8 0.4	8 0.4	8 0.4	8 0.4
Peru	22 1.1	35 1.7	49 2.4	104 5.2	130 6.5	130 6.5	116 5.8	171 8.5	171 8.5	170 8.5	169 8.4	162 8.0	168 8.3	169 8.4
Puerto Rico	...	...	84 4.2	155 7.7	283 14.1	283 14.1	283 14.1	284 14.1	284 14.1	284 14.1	284 14.1	284 14.1	123 6.1	121 6.0
Trinidad & Tobago	49 2.4	104 5.2	182 9.1	417 20.8	461 23.0	461 23.0	461 23.0	461 23.0	461 23.0	456 22.7	456 22.7	456 22.7	375 18.6	375 18.6
Uruguay	5 0.2	16 0.8	28 1.4	40 2.0	43 2.1	46 2.3	46 2.3	43 2.1	43 2.1	40 2.0	40 2.0	45 2.2	45 2.2	45 2.2
Venezuela	55 2.7	254 12.6	886 44.1	1,324 65.9	1,532 76.3	1,451 72.3	1,446 72.0	1,446 72.0	1,446 72.0	1,446 72.0	1,349 67.2	1,323 65.7	1,284 63.7	1,224 60.9
Virgin Islands	...	...	...	220 11.0	590 29.4	728 36.2	728 36.2	728 36.2	728 36.2	728 36.2	728 36.2	640 31.8	600 29.8	600 29.8
Others	...	...	...	31 1.5	72 3.6	74 3.7	46 2.3	58 2.9	60 3.0	62 3.1	62 3.1	59 2.9	77 3.8	55 2.7
Total	854 42.2	1,397 69.4	2,841 141.5	5,334 265.3	7,661 381.4	7,690 382.9	7,905 393.5	8,497 422.8	8,501 423.0	8,620 429.1	8,712 433.6	8,664 430.0	8,016 399.2	7,945 395.2

REFINING CAPACITY STATISTICS

NORTH AMERICA

Upper figures = 1,000 b/d
Lower figures = million ty

	1940	1950	1960	1970	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984
Canada	203 10.1	329 16.4	1,002 49.9	1,355 67.5	2,024 100.8	2,076 103.4	2,100 104.6	2,126 105.9	2,225 110.8	2,222 110.6	2,168 107.9	2,200 109.2	2,020 100.3	1,807 90.0
United States	4,460 222.1	6,696 333.5	10,400 517.9	12,079 601.5	14,845 739.3	15,043 749.1	15,930 793.3	16,171 805.3	17,150 854.1	17,720 882.5	18,470 919.6	18,700 928.3	16,800 834.0	15,930 793.2
Total	4,663 232.2	7,025 349.9	11,402 567.8	13,434 669.0	16,869 840.1	17,119 852.5	18,030 897.9	18,297 911.2	19,375 964.9	19,942 993.1	20,638 1,027.5	20,900 1,037.5	18,820 934.3	17,737 883.2

ASIA-PACIFIC

Upper figures = 1,000 b/d
Lower figures = million ty

	1940	1950	1960	1970	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984
Australia	4 0.2	14 0.7	237 11.8	581 28.9	722 36.0	707 35.2	706 35.2	709 35.3	708 35.3	725 36.1	743 37.0	742 36.8	716 35.5	722 35.9
Bangladesh	...	...	...	...	31 1.5	31 1.5	31 1.5	31 1.5	31 1.5	31 1.5	31 1.5	31 1.5	31 1.5	22 1.1
Brunei-Malaysia-Singapore	10 0.5	10 0.5	46 2.3	302 15.0	969 48.3	1,001 49.8	1,085 54.0	1,086 54.1	1,058 52.7	1,093 54.4	1,246 62.0	1,271 63.1	1,271 63.1	1,313 65.5
Eurma*	...	...	...	...	...	...	...	...	...	...	26 1.3	26 1.3	26 1.3	26 1.3
Guam*	...	...	...	...	...	...	...	...	...	...	44 2.2	44 2.2	44 2.2	44 2.2
India	10 0.5	6 0.3	112 5.6	436 21.7	555 27.6	564 28.1	567 28.2	564 28.1	626 31.2	557 27.7	557 27.7	557 27.7	753 37.4	779 38.8
Indonesia	170 8.5	203 10.1	274 13.6	268 13.3	428 21.3	428 21.3	428 21.3	528 26.3	528 26.3	528 26.3	445 22.2	498 24.7	341 16.9	387 19.3
Japan	53 2.6	34 1.7	640 31.9	2,796 139.2	5,134 255.7	5,417 269.8	5,552 276.5	5,467 272.2	5,480 272.9	5,509 274.3	5,454 271.6	5,601 278.0	5,548 275.4	5,020 250.0
Korea, South	...	...	...	175 8.7	425 21.2	435 21.7	424 21.1	475 23.6	542 27.0	601 29.9	607 30.2	755 37.5	755 37.5	776 38.6
New Zealand*	...	...	...	...	...	...	...	...	...	...	74 3.6	74 3.6	74 3.6	74 3.6
Okinawa*	...	...	...	...	...	...	...	...	...	...	208 10.4	208 10.4	183 9.1	153 7.6
Pakistan	...	5 0.2	6 0.3	115 5.7	79 3.9	74 3.7	74 3.7	106 5.3	110 5.5	98 4.9	122 6.1	133 6.6	133 6.6	126 6.3
Philippines	...	...	22 1.1	180 9.0	274 13.6	247 12.3	251 12.5	253 12.6	253 12.6	253 12.6	246 12.2	286 14.2	286 14.2	286 14.2
Sri Lanka*	...	...	...	...	...	...	...	...	...	...	50 2.5	50 2.5	50 2.5	50 2.5
Taiwan	...	...	28 1.4	129 6.4	244 12.1	335 16.7	425 21.2	425 21.2	425 21.2	425 21.2	515 25.6	515 25.6	515 25.6	515 25.6
Thailand	...	...	1 0.1	62 3.1	166 8.3	166 8.3	161 8.0	160 8.0	160 8.0	186 9.3	186 9.3	176 8.7	176 8.7	176 8.7
Others	27 1.3	4 0.2	9 0.4	137 6.8	371 18.5	374 18.6	369 18.4	373 18.6	364 18.1	380 18.9	...	...	...	...
Total	274 13.6	276 13.7	1,375 68.4	5,181 257.8	9,398 468.0	9,779 487.0	10,073 501.8	10,177 506.8	10,285 512.2	10,386 517.1	10,554 525.5	10,985 548.3	10,902 541.1	10,473 521.5
*Prior to 1981, included in others														
Total, exclu. U.S.S.R., China, E. Europe	6,608 328.3	10,513 523.0	21,148 1,052.9	42,078 2,094.6	57,465 2,861.8	59,449 2,960.1	61,680 3,071.3	62,672 3,120.4	63,702 3,171.8	64,375 3,205.2	65,548 3,263.4	65,365 3,244.7	60,729 3,024.0	58,466 2,902.7

REFINING CAPACITY STATISTICS

AFRICA

Upper figures = 1,000 b/d
Lower figures = million ty

	1940	1950	1960	1970	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984
Algeria	...	...	...	47 2.3	115 5.7	122 6.1	122 6.1	122 6.1	122 6.1	122 6.1	122 6.1	122 6.1	137 6.8	137 6.8
Angola-Cabinda	...	...	2 0.1	20 1.0	36 1.8	35 1.7	32 1.6	32 1.6	32 1.6	36 1.8	31 1.5	32 1.6	32 1.6	32 1.6
Cameroon*	...	...	...	...	...	...	...	...	...	...	...	43 2.1	43 2.1	41 2.0
Congo*	...	...	...	...	...	...	...	...	...	...	...	...	...	21 1.0
Egypt	17 0.8	39 1.9	87 4.3	193 9.6	180 9.0	180 9.0	236 11.8	234 11.7	251 12.5	234 11.6	292 14.5	292 14.5	341 16.9	369 18.4
Ethiopia*	...	...	...	...	...	...	...	...	...	...	14 0.7	14 0.7	14 0.7	15 0.7
Gabon*	...	...	...	...	...	...	...	...	...	...	20 1.0	20 1.0	20 1.0	20 1.0
Ghana	...	...	...	29 1.4	28 1.4	28 1.4	26 1.3	26 1.3	26 1.3	26 1.3	26 1.3	27 1.3	27 1.3	28 1.4
Ivory Coast	...	...	...	19 0.9	44 2.2	40 2.0	41 2.0	39 1.9	39 2.0	50 2.5	50 2.5	50 2.5	90 4.5	90 4.5
Kenya	...	...	...	44 2.2	48 2.4	86 4.3	86 4.3	95 4.7	95 4.7	95 4.7	95 4.7	79 3.9	79 3.9	79 3.9
Liberia*	...	...	...	...	...	...	...	...	...	...	15 0.7	15 0.7	15 0.7	15 0.7
Libya	...	...	...	10 0.5	76 3.8	76 3.8	135 6.7	135 6.7	137 6.8	129 6.9	142 7.1	130 6.5	130 6.5	125 6.2
Madagascar*	...	...	...	...	...	...	...	...	...	...	11 0.5	11 0.5	16 0.8	16 0.8
Morocco	...	...	2 0.1	35 1.7	59 2.9	68 3.4	68 3.4	72 3.6	72 3.6	72 3.6	72 3.6	72 3.6	74 3.7	74 3.7
Mozambique	...	...	...	20 1.0	17 0.8	11 0.5	11 0.5	11 0.5	16 0.8	16 0.8	16 0.8	16 0.8	16 0.8	17 0.8
Nigeria	...	...	...	40 2.0	60 3.0	57 2.8	60 3.0	60 3.0	159 7.9	160 8.0	160 8.0	254 12.6	260 12.9	247 12.3
Senegal	...	...	...	13 0.6	15 0.7	12 0.6	19 0.9	20 1.0	20 1.0	20 1.0	20 1.0	18 0.9	18 0.9	18 0.9
Sierra Leone*	...	...	...	...	...	...	...	...	...	...	10 0.5	10 0.5	10 0.5	10 0.5
South Africa	1	...	25 1.2	178 8.9	397 19.8	434 21.6	433 21.6	446 22.2	478 23.8	478 23.8	469 23.4	424 21.0	424 21.0	389 19.4
Sudan	...	...	...	20 1.0	22 1.1	24 1.2	24 1.2	24 1.2	26 1.3	26 1.3	24 1.2	24 1.2	24 1.2	24 1.2
Tanzania	...	...	...	14 0.7	16 0.8	16 0.8	12 0.6	12 0.6	17 0.8	17 0.8	12 0.6	14 0.7	17 0.8	17 0.8
Togo*	...	...	...	...	...	...	...	...	...	...	20 1.0	20 1.0	20 1.0	20 1.0
Tunisia	...	...	...	23 1.1	25 1.2	23 1.1	22 1.1	22 1.1	34 1.7	34 1.7	34 1.7	34 1.7	34 1.7	34 1.7
Zaire*	...	...	...	...	...	...	...	...	...	...	17 0.8	17 0.8	17 0.8	17 0.8
Others	...	...	...	87 4.3	108 5.4	108 5.4	117 5.8	117 5.8	143 7.1	142 7.1	10 0.5	10 0.5	...	...
Total	18 0.8	39 1.9	116 5.7	792 39.2	1,246 62.0	1,320 65.7	1,444 71.9	1,467 73.0	1,867 93.0	1,806 90.0	1,707 85.1	1,773 88.0	1,882 93.4	1,880 93.6

*Prior to 1981, included in others

Survey of operating refineries worldwide

(capacities as of Jan. 1, 1984)

Country	No. plants	Crude, b/cd	Catalytic cracking	Catalytic reforming	Country	No. plants	Crude, b/cd	Catalytic cracking	Catalytic reforming
Abu Dhabi	3	185,250	...	12,334	Lebanon	2	52,000	7,250	7,292
Algeria	4	137,400	...	23,600	Liberia	1	15,000	...	2,000
Angola	1	32,100	...	1,900	Libya	2	125,000	...	13,982
Argentina	12	678,400	102,500	37,700	Madagascar	1	16,350	...	2,600
Australia	12	722,100	174,300	174,000	Malaysia	4	205,000	6,300	14,000
Austria	1	268,000	23,000	29,000	Martinique	1	11,000	...	2,500
Bahamas	1	500,000	...	...	Mexico	9	1,269,000	297,000	163,800
Bahrain	1	250,000	34,200	17,100	Morocco	2	74,000	...	8,623
Bangladesh	1	22,200	...	1,720	Mozambique	1	17,000	...	2,500
Barbados	1	3,000	...	...	Netherlands	7	1,551,500	115,000	178,900
Belgium	5	694,100	100,200	90,900	Netherlands Antilles	2	740,000	40,000	15,000
Bolivia	3	46,930	...	14,158	New Zealand	1	74,000	...	24,000
Brazil	13	1,301,400	315,400	21,600	Nicaragua	1	15,000	...	3,000
Brunei	1	10,000	...	...	Nigeria	3	247,000	41,400	36,450
Burma	2	26,300	...	...	Norway	4	242,700	...	29,000
Cameroon	1	41,135	...	6,390	Okinawa	3	153,000	...	11,600
Canada	28	1,806,600	437,500	354,550	Oman	1	48,082	...	9,644
Chile	2	141,000	35,000	10,000	Pakistan	3	126,450	...	5,060
China, Taiwan	2	515,410	36,160	36,160	Panama	1	100,000	...	7,500
Colombia	4	211,000	91,000	6,000	Paraguay	1	7,500	...	...
Congo	1	21,000	...	2,000	Peru	5	168,550	21,950	1,640
Costa Rica	1	17,000	...	1,500	Philippines	3	286,000	16,100	40,200
Cyprus	1	15,000	...	3,250	Portugal	2	281,882	...	38,169
Denmark	3	174,000	...	30,650	Puerto Rico	2	121,000	12,000	5,800
Dominican Republic	2	44,000	...	8,300	Qatar	1	63,200	...	11,830
Ecuador	3	83,582	11,550	2,513	Saudi Arabia	4	860,600	10,000	38,000
Egypt	6	369,330	...	10,800	Senegal	1	18,000	...	1,900
El Salvador	1	16,300	...	2,800	Sierra Leone	1	10,000	...	...
Ethiopia	1	14,600	...	1,898	Singapore	5	1,101,000	...	51,000
Finland	2	299,000	37,500	48,000	Somalia	1	10,000	...	...
France	19	2,670,400	250,300	361,100	South Africa	4	388,500	82,500	62,000
Gabon	1	20,000	...	1,400	Spain	10	1,493,000	63,500	195,700
Germany	27	2,386,250	184,500	401,350	Sri Lanka	1	50,000	...	3,750
Ghana	1	28,000	...	5,550	Sudan	1	24,000	...	2,100
Greece	4	368,700	23,000	30,300	Sweden	6	452,800	...	81,900
Guam	1	43,700	...	...	Switzerland	2	137,000	...	25,000
Guatemala	1	16,000	...	3,000	Syria	2	228,790	...	19,348
Honduras	1	14,000	...	1,800	Tanzania	1	17,000	...	4,200
Hungary	5	311,500	...	30,100	Thailand	3	176,000	8,800	25,900
India	12	778,699	74,350	15,060	Togo	1	20,000	...	4,400
Indonesia	9	387,000	11,000	17,250	Trinidad	2	375,000	25,000	27,000
Iran	4	530,000	...	63,845	Tunisia	1	34,000	...	3,300
Iraq	7	168,500	...	5,000	Turkey	4	472,460	41,260	43,875
Ireland	1	56,000	...	14,500	United Kingdom	16	2,091,500	341,000	369,500
Israel	2	190,000	15,000	24,300	Uruguay	1	45,000	5,000	3,000
Italy	24	3,050,100	271,200	347,900	Venezuela	7	1,224,200	178,800	6,000
Ivory Coast	2	90,075	...	14,600	Virgin Islands	1	600,000	...	125,000
Jamaica	1	35,500	...	354	Yemen, S.	1	130,000	...	8,000
Japan	45	5,020,350	442,950	556,900	Yugoslavia	7	296,687	1,960	45,156
Jordan	1	100,000	4,410	8,640	Zaire	1	17,000	...	3,000
Kenya	1	79,000	...	8,500	Zambia	1	24,500	...	5,600
Korea	6	775,870	...	36,550					
Kuwait	5	622,800	...	48,120					
					Total	447	42,695,232	3,999,840	4,734,661

Country-by-country refining survey

Company and refinery location	Crude	Catalytic cracking	Catalytic reforming
ABU DHABI			
Abu Dhabi National Oil Co.—Ruweis	114,000	....	....
Umm Al Nar—1	14,250	....	² 2,520
Umm Al Nar—2	57,000	....	² 9,814
Total	185,250	....	12,334

ALBANIA

Government-owned refineries at Balish, Cerrik, Stalin.

Total	40,000		
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ALGERIA

Sonatrach: Arzew	60,000		8,600
Hassi Messaoud	2,400		
Maison Carree	60,000		15,000
Skikda	15,000		
Total	137,400		23,600

ANGOLA

Petrangol SARL—Luanda	32,100		¹ 1,900
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ARGENTINA

Astratur, Refinerías Patagónicas de			
Petróleo SA—Comodoro Rivadavia†	6,300		
Destilería Argentina de Petróleo SA—	....	....	....
Lomas de Zamora	2,000	....	....
Esso SAPA—Campana	93,400	¹ 22,500	¹ 7,700
Galvan	17,000	....	....
Isaura SA—Bahia Blanca	12,000	....	....
Shell Cia. Argentina de Petróleo SA—	....	....	....
Buenos Aires	115,000	19,000	9,500
Yacimientos Petrolíferos Fiscales—	....	....	....
Campo Duran	32,000	....	....
Dock Sud	4,000	....	....
La Plata†	216,000	¹ 45,000	¹ 9,000
Lujan de Cuyo	129,000	¹ 16,000	¹ 9,000
Plaza Huincul	23,000	....	2,500
San Lorenzo	35,000	....	....
	² 12,500	....	....
Total	678,400	102,500	37,700

Solvent extraction: ¹5,300 b/cd.

†Refinery closed due to fire. Damaged equipment being replaced and plant will be back on stream May 1984. Figures not included in total.

AUSTRALIA

Amoco Australia PL—Bulwer Island	41,500	¹ 11,000	² 8,500
Ampol Refineries Ltd.—Lytton	58,000	¹ 26,000	¹ 13,000
			² 3,200
Australian Oil Refinery PL—Kurnell†	129,000	¹ 37,000	² 25,300
Australian Lubricating Oil Refinery	....	....	....
Ltd.—Kurnell	....	....	....
BP Australia—Kwinana ²	100,000	¹ 26,300	¹ 3,000
		² 6,600	² 13,000
Westernport	57,000	....	⁴ 16,000
Mobil Oil Australia Ltd.—Adelaide	....	....	....
Petroleum Refineries Australia PL—	....	....	....
Adelaide	46,500	....	² 16,000
Altona	98,600	² 24,000	² 28,000
Shell Refining (Australia) PL—Clyde	69,000	25,000	18,000
Geelong	112,000	¹ 25,000	30,000
Total Refineries Australia Ltd.—	....	....	....
Matraville	10,500	....	....
Total	722,100	174,300	174,000

Solvent extraction: ¹4,900 b/cd, ²2,800 b/cd.

Company and refinery location	Crude	Catalytic cracking	Catalytic reforming
AUSTRIA			
OeMV—Schwechat	268,000	¹ 23,000	² 14,000
			⁴ 15,000
Total	268,000	23,000	29,000

BAHAMAS

Bahamas Oil Refining Co.—Freeport	500,000		
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BAHRAIN

Bahrain Petroleum Co. BSC (Closed)			
—Awali	250,000	¹ 34,200	² 17,100

BANGLADESH

Eastern Refinery Ltd.—Chittagong	22,200		¹ 1,720
Total	22,200		1,720

BARBADOS

Mobil Oil Barbados Ltd.—Bridgetown	3,000		
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BELGIUM

Belgian Refining Corp. NV—Antwerp	108,500		² 12,000
Belgian Shell NV—Ghent	8,600		
Belgische Petroleum Raffinaderij	....	....	....
—NV—Antwerp	77,000	....	² 19,000
SA Esso NV—Antwerp	194,000	¹ 24,700	⁴ 29,700
SIBP NV—Antwerp	306,000	¹ 75,500	² 30,200
Total	694,100	100,200	90,900

BOLIVIA

Yacimientos Petrolíferos	....	....	....
Fiscales Bolivianos—Cochabamba ¹	27,500	....	¹ 7,758
Santa Cruz	16,430	....	¹ 6,400
Sucre	3,000	....	....
Total	46,930	....	14,158

Solvent extraction: ¹166 b/cd.

BRAZIL

Petróleo Brasileiro SA: Araucária,	....	....	....
Paraná ¹	144,800	¹ 45,500	....
Betim, Minas Gerais	120,600	¹ 30,400	....
Canoas, Rio Grande do Sul	63,300	¹ 13,600	....
Cubatão, São Paulo	127,300	¹ 48,300	¹ 10,200
Duque de Caxias, Rio de Janeiro ²	217,100	¹ 39,800	¹ 11,400
Fortaleza, Ceará	4,200	....	....
Manaus, Amazonas	8,400	¹ 1,800	....
Mataripe, Bahia ³	122,900	¹ 25,000	....
Mauá, Santo André, São Paulo	27,200	² 14,400	....
Paulínia, São Paulo	289,500	¹ 39,800	....
São José dos Campos, São Paulo	156,800	¹ 54,300	....
Refinaria de Petróleo Ipiranga SA—Rio	....	....	....
Grande do Sul	9,300	¹ 2,500	....
Refinaria de Petróleos de Manguinhos	....	....	....
SA—Rio de Janeiro	10,000	....	....
Total	1,301,400	315,400	21,600

Solvent extraction: ¹28,400 b/d, ²30,200 b/d (13,100 b/d for lubes), ³3,400 (for lubes).

BRUNEI

Brunei Shell Petroleum CL—Seria	10,000		
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REFINING

Company and refinery location	Crude	Catalytic cracking	Catalytic reforming
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BULGARIA

Government-owned refineries at Burgas, Plevan, Ruse.

Total	300,000		
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BURMA

Petrochemical Industries Corp.-Chauk	5,300		
Syriam	20,000		
Total	26,300		

CAMEROON

Sonara-National Refining CL-Cape Limboh, Limbe	41,135		² 6,390
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CANADA

Alberta			
Gulf Canada Products Co.-Calgary	12,900		
Edmonton	121,100	¹ 36,000	² 13,100
Husky Oil Operations Ltd.-Lloydminster	23,300		
Imperial Oil Ltd.-Edmonton	164,000	¹ 48,500	² 21,300
Shell Canada Ltd.-Bowden	5,000		2,700
Texaco Canada Inc.-Edmonton	28,000	¹ 9,000	² 9,000
Total	354,300	93,500	46,100

British Columbia			
Chevron Canada Ltd.-Norih Burnaby	36,000	¹ 10,500	² 11,500
Gulf Canada Products Co.-Port Moody	3,200	² 9,700	
Husky Oil Operations Ltd.-Prince George	9,400	¹ 3,250	² 1,300
Imperial Oil Ltd.-loco	40,900	¹ 12,800	² 6,700
Petro-Canada Products Inc.-Taylor	19,000	¹ 6,250	² 2,950
Shell Canada Ltd.-Shellburn, Burnaby	24,000	¹ 6,300	4,000
Total	166,500	50,500	36,150

New Brunswick			
Irving Oil Ltd.-St. John	237,500	¹ 17,100	² 34,650
Total	237,500	17,100	34,650

Northwest Territories			
Imperial Oil Ltd.-Norman Wells	2,900		

Nova Scotia			
Imperial Oil Ltd.-Dartmouth	84,000	¹ 23,300	² 8,700
Texaco Canada Ltd.-Halifax	20,000	¹ 7,200	² 3,600
Total	104,000	30,500	12,300

Ontario			
Gulf Canada Products Co.-Clarkson ¹	60,000	¹ 18,400	² 8,700
Imperial Oil Ltd.-Sarnia	124,100	¹ 25,200	² 13,600
Petro-Canada Products Inc.-Oakville	80,000	¹ 23,000	² 5,000
Shell Canada Ltd.-Sarnia	71,000	¹ 16,000	23,900
Sun Cl-Sarnia	90,000	² 16,200	² 25,650
Texaco Canada Ltd.-Nanticoke	95,000	¹ 40,000	² 24,000
Total	520,100	138,800	137,650

Solvent extraction: ¹4,600 b.c.d.

Quebec			
Gulf Canada Products Co.-Montreal ¹	58,000	¹ 22,100	² 8,600
Petro-Canada Products Inc.-Montreal	90,000	² 18,000	² 30,500
Shell Canada Ltd.-Montreal	120,000	¹ 24,000	25,000
Ultramar Canada Inc.-St. Romuald	100,000	¹ 30,000	² 14,600
Total	368,000	94,100	78,700

Solvent extraction: ¹4,400 b.c.d.

Saskatchewan			
Consumer's Cooperative Refineries Ltd.-Regina	40,000	¹ 13,000	¹ 9,000

Company and refinery location	Crude	Catalytic cracking	Catalytic reforming
Gulf Canada Products Co.-Moose Jaw	13,300		
Total	53,300	13,900	9,900
Total Canada	1,806,600	437,500	354,550

CHILE

Petrox SA-Concepción	72,000	¹ 15,000	¹ 4,000
Refineria de Concon-Concon ¹	69,000	¹ 20,000	¹ 6,000
Total	141,000	35,000	10,000

¹Solvent extraction: 945 b.c.d.

CHINA

Government-owned refineries at Anshan, Beijing, Dalian, Daqing, Fushun, Hangzhou, Jinxi, Karamai-Dushanzi, Lanchow, Lenghu, Maoming, Nanchong, Nanjing, Shanghai, Shengli, Tianjin, Yumen.

Total	1,810,000		
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CHINA, TAIWAN

Chinese Petroleum Corp.-Kaohsiung	425,000	¹ 22,600	² 18,080
Tao-Yuan	90,410	² 13,560	
Total	515,410	36,160	36,160

COLOMBIA

Empresa Colombiana de Petróleos			
-Barrancabermeja-Santander ¹	135,000	¹ 62,000	² 6,000
Cartagena, Bolivar	70,000	¹ 29,000	
Orito, Putumayo	1,000		
Libu, N. de Santander	5,000		
Total	211,000	91,000	8,000

Solvent extraction: ¹36,400 b.c.d.

CONGO

Coral-Pointe-Noire	21,000		² 2,000
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COSTA RICA

Refinadora Costarricense de Petróleo			
SA-Limon	17,000		² 1,500
Total	17,000		1,500

CUBA

Government-owned refineries at Cabaiguan, Havana, Santiago de Cuba.

Total	160,000		
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CYPRUS

Cyprus Petroleum Refinery Ltd.-Larnaca	15,000		² 3,250
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CZECHOSLOVAKIA

Government owned refineries at Bratislava, Kolin, Kralupy, Pardubice, Strazke, Ziluzi, Zvolen.

Total	455,000		
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DENMARK

AS Dansk Shell-Fredericia	56,000		11,000
Dansk Esso AS-Kalundborg	68,000		¹ 8,400
Kuwait Petroleum Refining (Danmark) A/S-Guldhavn	50,000		² 11,250
Total	174,000		30,650

DOMINICAN REPUBLIC

Falconbridge Dominicana C por A-La Peguera	16,000		
Refineria Dominicana de Petróleo			
SA-Nigua	28,000		8,300
Total	44,000		8,300

Company and refinery location	Crude	Catalytic cracking	Catalytic reforming
ECUADOR			
CEPE-Esmeraldas	50,282	¹ 11,550	² 2,513
Anglo Ecuadorian Oilfields Ltd.- La Libertad	300		
Texaco-Lago-Agrio	1,000		
Total	51,582	11,550	2,513

EGYPT

Alexandria Petroleum Co.-Alexandria (El-Mex)	105,000		
El Nasr Petroleum Co.-Alexandria (El-Amerna)	67,500		
Suez	70,830		
Suez Oil Processing Co.-Mostorod	84,150		² 10,800
Suez	18,900		
Tanta	22,950		
Total	369,330		10,800

EL SALVADOR

Refineria Petrolera Acajutla SA- Acajutla	13,300		² 2,800
Total	16,300		2,800

ETHIOPIA

Ethiopian Petroleum Corp.-Assab	14,600		² 1,898
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FINLAND

Neste Oy-Naantali	55,000	² 9,500	
Porvoo	243,000	¹ 28,000	² 28,000
Total	298,000	37,500	48,000

FRANCE

Cie. Francaise de Raffinage-Gonfreville J. Orcher ¹	315,000	¹ 28,500	² 45,100
La Mede	136,000	¹ 30,000	² 23,400
			⁴ 17,600
Mardyck	129,000	¹ 23,000	² 20,500
Cie. Rhénane de Raffinage- Reichstett-Vendheim	86,000		12,000
Elf France-Ambes		¹ 6,300	
Donges	183,000	¹ 13,000	² 30,600
Feyzin	185,000	¹ 15,500	² 9,700
Gargenville	139,000		
Grandpuits	100,000	¹ 21,600	² 15,000
Esso SAF-Fos sur Mer	167,200	¹ 16,400	² 26,000
Port Jerome	167,200	¹ 22,000	² 16,800
Mobil Oil Francaise-Frontignon	82,000	² 17,000	² 20,000
Notre Dame de Cravenchon	57,000		² 17,000
Raffinerie de Strasbourg-Herrlisheim	92,000		¹ 22,000
Shell Francaise-Berre l'Etang	210,000	19,000	15,000
Pauillac	92,000	¹ 19,000	13,000
Petit Couronne	285,000	¹ 19,000	41,000
Ste. Francaise des Petroles BP- Dunkirk			
Lavera	174,000		¹ 5,400
Vernon	72,000		² 11,000
Total	2,670,400	250,300	316,100

¹Solvent extraction 8,000 b/cd.**GABON**

Ste. Gabonaise de Raffinage-Port Gentil	20,000		1,400
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GERMANY, E.

Government-owned	470,000		
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GERMANY, WEST

Deutsche BP AG-Finkenwerder			¹ 7,650
Hamburg (imported feedstocks)			
Vohburg	102,000	¹ 16,000	² 16,000
Deutsche Marathon Petroleum GmbH-Burghausen	70,000		

Company and refinery location	Crude	Catalytic cracking	Catalytic reforming
Deutsche Shell AG-Godorf	170,000		27,000
Harburg-Grasbrook	86,000	12,000	15,000
Monheim	8,000		
Deutsche Texaco AG-Heide	105,000	² 8,000	² 17,000
Elf Bitumenwerke GmbH-Brunsbuettel	7,500		
Elf Gelsenberg-Speyer	140,000		² 22,000
Erdol Raffinerie Duisburg GmbH- Duisburg	37,800		² 7,300
Erdolraffinerie Ingolstadt AG- Ingolstadt, Donau	90,000		² 30,000
Erdol Raffinerie Neustadt GmbH-Neustadt-Donau	144,000	¹ 22,700	¹ 17,700
Erdölwerke Frisia-Emden	42,750		² 5,400
Esso AG-Hamburg	110,000	¹ 14,000	² 12,800
Ingolstadt	100,000	¹ 18,900	² 12,800
Karlsruhe	160,000		² 27,900
Gewerkschaft Erdol-Raffinerie Deurag-Nerag-Misburg	45,000		7,000
Mobil Oil AG-Wilhelmshaven	160,000		² 32,000
Worth	75,000	¹ 15,000	² 14,000
Oberrheinische Mineralölwerke GmbH-Karlsruhe	142,000	¹ 60,000	² 10,300
			² 19,700
Ölwerke Julius Schindler GmbH- Hamburg	9,300		
Ruhr Öl GmbH-Gelsenkirchen	215,400	¹ 6,000	¹ 11,900
		² 11,900	² 27,000
Saarland-Raffinerie GmbH-Völklingen	72,000		
Union Rheinische Braunkohlen Kraftstoff AG-Wesseling	95,000		¹ 9,000
Wintershall AG-Lingen	91,400		¹ 7,400
Mannheim	103,000		² 18,400
Salzbergen	5,100		
Total	2,386,250	184,500	401,350

GHANA

Ghanaian Italian Petroleum CL-Tema	28,000		¹ 5,550
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GREECE

Hellenic Aspropyrgos Refinery SA- Aspropyrgos	110,000		¹ 5,200
			² 9,500
Motor Oil (Hellas) Corinth Refineries SA-Aghii Theodori	100,000	¹ 23,000	¹ 8,500
Petrola Hellas SA-Elefsis	86,700		
Thessaloniki Refining Co. AE- Thessaloniki	72,000		² 7,100
Total	368,700	23,000	30,300

GUAM

Guam Oil & Refining Co.-Apra Heights	43,700		
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GUATEMALA

Texas Petroleum Co.-Escuintla	16,000		² 5,000
Total	16,000		5,000

HONDURAS

Refineria Texas de Honduras SA-Puerto Cortes	14,000		¹ 1,800
Total	14,000		1,800

HUNGARY

Dunai KV-Százhalombatta	196,000		² 26,000
Komárom KV-Komárom	32,500		² 4,100
Tisza KV-Leninváros	66,500		
Nyirboghány	6,500		
Zala KV-Zalaegerszeg	10,000		
Total	311,500		30,100

INDIA

Bharat Petroleum CL-Mahul, Bombay	105,432	¹ 17,000	7,000
Bongaigaon Refineries & Petrochemical Ltd.-Dhalgaon, Assam	20,000		
Cochin Refineries Ltd.-Kerala	66,000		² 5,660
Hindustan Petroleum CL- Mahul, Bombay	90,000	¹ 9,000	

REFINING

Company and refinery location	Crude	Catalytic cracking	Catalytic reforming
Visakhapatnam	30,123	.....	.....
Indian Oil CL-Barauni	66,330	12,800	.....
Digboi	10,050	.....	.....
Gauhati	17,085	6,000	.....
Gujarat	146,730	² 18,400	7,000
Haldia	50,250	4,500	.....
Mathura	120,699	³ 18,050	.....
Madras Refineries Ltd.-Madras	56,000	.....	¹ 2,400
Total	778,699	74,350	15,060

INDONESIA

Lernigas-Cepu, Central Java	1,000	.....	.....
Pertamina-Balikpapan, Kalimantan ¹	55,000	.....	.....
Cilecap, Central Java	90,000	.....	² 11,000
Dumai, Central Sumatra	100,000	.....	² 6,250
Pangkalan Brandan, North Sumatra	5,000	.....	.....
Plaju, South Sumatra	50,000	.....	.....
Sungai Gerong, South Sumatra	50,000	¹ 11,000	.....
Sungai Pakning, Central Sumatra	35,000	.....	.....
Wonokromo, East Java	1,000	.....	.....
Total	387,000	11,000	17,250

Solvent refining: ¹650 b/cd.

IRAN

National Iranian Oil Co.-Esfahan	200,000	.....	29,600
Shiraz	40,000	.....	6,245
Tabriz	80,000	.....	.....
Tehran	210,000	.....	28,000
Total	530,000	.....	63,845

Note: Present status uncertain due to Iran-Iraq war.

IRAQ

Oil Refineries Administration-Basra	70,000	.....	.....
Daura	71,000	.....	5,000
K3-Haditha	7,000	.....	.....
Khanqin	12,000	.....	.....
Muthia	4,500	.....	.....
Qaiyarah, Mosul	2,000	.....	.....
Iraqi Company for Oil Operations-Kirkuk	2,000	.....	.....
Total	168,500	.....	5,000

Note: Present status uncertain due to Iran-Iraq war.

IRELAND

Irish Refining CL-Whitegate	56,000	.....	² 14,500
Total	56,000	.....	14,500

ISRAEL

Oil Refineries Ltd.-Ashdod	70,000	.....	² 9,300
Haifa	120,000	¹ 15,000	² 15,000
Total	190,000	15,000	24,300

ITALY

ANIC SpA-Gela	80,000	¹ 27,000	² 10,000
Anonima Petroli Italiana-Falconara, Marittima	83,000	.....	² 11,000
Aquila SpA-Trieste	110,000	.....	17,000
ERG SpA-Genoa, San Quirico	130,000	.....	⁴ 10,500
Esso Italiana SpA-Augusta, Siracusa	181,200	¹ 40,100	15,100
Chimiche Italiane de Petrolio SpA-Frassino, Mantovano	55,000	.....	9,500
Industria Italiana Petroli-La Spezia	80,800	.....	¹ 20,200
Taranto	90,900	.....	² 16,000
Ipcom SpA-Busalla	46,500	.....	.....
Irom-Industria Rafinazione Oli Minerali-Porto Marghera	108,000	.....	² 16,000
ISAB-Melilli	220,000	.....	⁴ 34,500
Lombarda Petroli SpA-Villasanta	23,500	.....	⁴ 4,000

Company and refinery location	Crude	Catalytic cracking	Catalytic reforming
Mediterranea SpA-Milazzo	145,000	¹ 40,000	³ 10,000
Mobil Oil Italiana SpA-Naples	100,000	² 18,400	² 12,500
Montedipe SpA-Priolo, Siracusa	300,000	¹ 30,000	¹ 10,000
Raffineria del Po SpA-Sannazaro de Burgondi	230,000	¹ 27,000	² 10,500
Raffineria di Roma SpA-Rome	91,200	.....	² 15,100
Saras SpA-Sarroch	324,000	¹ 63,000	² 27,000
Sarom-Ravenna	120,000	.....	¹ 10,000
Sarpom-Trecate, Novara	215,000	¹ 12,000	27,000
Soc. Petroliera Italiana-Arcola, La Spezia	25,000	.....	.....
Stanic-Livorno	111,200	.....	² 19,500
Tamoli Italia SpA-Cremona	100,000	.....	³ 8,800
Total	3,050,100	271,200	347,900

¹Solvent extraction 3,110 b/d (propane for lube oil and cat cracker feed)

IVORY COAST

Ste. Ivoirienne de Raffinage-Abidjan	80,000	.....	² 14,600
Ste. Multinationale de Bitumes-Abidjan	10,075		
Total	90,075		14,600

JAMAICA

Petrojam Ltd.-Kingston	35,500		¹ 354
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JAPAN

Asia Kyoseki CL-Sakaide, Kagawa	135,000	¹ 13,500	² 9,000
Asia Oil CL-Hakodate	22,500		² 1,170
Yokohama, Kanagawa	90,000	.....	² 12,600
Daikyo Oil CL-Yokkaichi City	175,000	¹ 20,000	² 6,000
Fuji Kosan Oil CL-Kainan	77,600	.....	.....
Fuji Oil CL-Sodegaura	189,900	¹ 10,800	² 13,600
General Sekiyu Seisei KK-Kawasaki	40,500	.....	¹ 8,500
Sakai	108,000	.....	² 25,000
Idemitsu Kosan CL-Chita, Aichi	123,500	.....	² 16,200
Himeji, Hyogo	104,500	² 13,500	.....
Ichihara, Chiba	199,500	¹ 37,800	² 20,700
Tokuyama, Yamaguchi	95,000	¹ 20,700	² 10,800
Tomakomai, Hokkaido	66,500	.....	² 9,900
Kashima Oil CL-Kashima, Ibaragi	150,000	¹ 14,000	² 12,500
Koa Oil CL-Manfu	125,100	¹ 12,600	² 8,730
Osaka	72,000	¹ 16,200	² 8,100
Kyokuto Petroleum Ltd.-Chiba	143,000	.....	² 14,500
Kyushu Oil CL-Oita	170,000	¹ 15,000	² 8,000
Maruzen Oil CL-Chiba	208,000	¹ 23,500	² 22,600
Matsuyama .....	(†)	.....	² 4,500
Sakai	99,500	¹ 17,600	² 4,500
Shimotsu	(†)	¹ 5,850	² 5,000
Mitsubishi Oil CL-Kawasaki	75,000	.....	² 15,000
Mizushima	220,000	¹ 30,000	² 33,700
Nichimo Sekiyu Seisei KK-Kawasaki	72,000	.....	² 17,600
Nihonkai Oil CL-Toyama	60,000	.....	.....
Nippon Mining CL-Chita	100,000	.....	² 22,000
Funakawa	14,150	.....	.....
Mizushima ¹	235,200	¹ 30,000	² 23,000
Nippon Oil CL-Nigata	28,000	.....	² 5,100
Nippon Petroleum Refining CL-Kudamatsu	22,000	.....	² 3,300
Muroran	125,000	¹ 16,000	² 18,000
Negishi	330,000	¹ 32,000	² 31,000
Yokohama	55,000	¹ 5,600	² 3,300
Seibu Sekiyu KK-Onoda	172,000	.....	18,000
Showa Sekiyu KK-Kawasaki	135,000	.....	20,000
Nigata	40,000	.....	4,400
Showa Yokkaichi Sekiyu KK-Yokkaichi	276,000	16,000	37,000
Taiyo Oil CL-Ehime	65,000	.....	² 5,000
Toa Nenryo Kogyo-Kawasaki	180,000	¹ 63,000	² 16,000
Shimizu	27,000	.....	² 4,600
Wakayama	153,900	¹ 29,300	² 36,000
Toa Oil CL-Kawasaki	100,000	.....	² 11,000
Toho Oil CL-Owase	40,000	.....	.....
Tohoku Oil CL-Sendai	100,000	.....	² 13,000
Total	5,020,350	442,950	556,900

¹Solvent extraction 4,300 b/d. †Units scrapped. ²Produced at vacuum unit.

Company and refinery location	Crude	Catalytic cracking	Catalytic reforming
JORDAN			
Jordan Petroleum Refinery-Zerka	100,000	¹ 4,410	² 8,640
Total	100,000	4,410	8,640

KENYA			
East African Oil Refineries Ltd.-Mombasa	79,000	....	¹ 8,500

KOREA, N.			
Government-owned, Unggi	42,000	....	....

KOREA, S.			
Honam Oil Refinery CL-Yosu	355,000	....	² 15,300
Kukdong Oil CL-Busan ¹	12,500	....	....
Kyung In Energy CL-Inchon	60,000	....	² 3,600
Modern Petroleum CL-Busan	2,000	....	....
Ssangyong Oil Refining CL-Onsan ²	81,370	....	....
Yukong Ltd.-Ulsan	265,000	....	² 17,650
Total	775,870	....	36,550

Solvent extraction: ¹2,100 b.cd. ²7,956 b.cd.

KUWAIT			
Arabian Oil CL-Ras Al Khafji	30,000	....	....
Getty Oil Co.-Mina Saud	50,300	....	....
Kuwait National Petroleum Co.-Mina Abdulla	97,800	....	....
Mina Al-Ahmadi	250,000	....	² 33,120
Shuaiba	195,000	140,000	² 15,000
Total	622,800	....	48,120

LEBANON			
Tripoli Oil Installations-Tripoli†	35,000	¹ 7,250	4,392
Mediterranean Refining Co.-Sidon	17,000	....	¹ 2,900
Total	52,000	7,250	7,292

†Bumbed in November 1983

LIBERIA			
Liberia Petroleum Refining-Monrovia	15,000	....	¹ 2,000
Total	15,000	....	2,000

LIBYA			
Azzawiya Oil Refining Co.-Azzawiya	120,000	....	² 12,982
Sirte Oil Co.-Brega	5,000	....	² 1,000
Total	125,000	....	13,982

MADAGASCAR			
Solima-Managareza, Tamatave	16,350	....	² 2,600

MALAYSIA			
Esso Malaysia Berhad-Port Dickson	40,000	¹ 6,300	....
Petronas Penapisan Sdn. Berhad-Kerteh, Kemaman, Terengganu	30,000	....	....
Sarawak Shell Berhad-Luton	45,000	....	....
Shell Refining Co. Berhad-Port Dickson	90,000	....	14,000
Total	205,000	6,300	14,000

MARTINIQUE			
Ste. Anonyme de la Raffinerie des Antilles-Fort-de-France	11,000	....	² 2,500

MEXICO			
Petroleos Mexicanos-Azcapotzalco	105,000	¹ 23,000	....
Cadereyta	235,000	¹ 40,000	² 20,000
Ciudad Madero	185,000	¹ 51,000	² 15,000
Minatitlan	199,000	¹ 24,000	² 54,000
		² 21,000	....
Poza Rica	16,000	....	....
Reynosa	9,000	....	....
Salamanca	200,000	¹ 40,000	² 24,800
		² 18,000	....
Salina Cruz	170,000	¹ 40,000	² 20,000
Tula, Hidalgo	150,000	¹ 40,000	² 30,000
Total	1,269,000	297,000	163,800

Company and refinery location	Crude	Catalytic cracking	Catalytic reforming
MOROCCO			
Samir-Mohammedia	50,000	....	6,500
Ste. Cherifienne des Petroles-Sidi Kacem	24,000	....	² 2,123
Total	74,000	....	8,623

MOZAMBIQUE			
Petromoc EE-Matola-Lingamo	17,000	....	² 2,500

NETHERLANDS			
BP Raffinaderij Nederland NV-Rotterdam	437,000	¹ 40,000	² 25,000
Chevron Petroleum Mij. (Nederland) BV-Pernis	260,000	....	² 38,000
Esso Nederland BV-Rotterdam	185,000	....	¹ 20,700
		....	² 28,000
Kuwait Petroleum Europoort BV-Europoort	75,500	....	² 8,200
Shell Nederland Raffinaderij BV-Pernis	436,000	¹ 75,000	45,000
Smid & Hollander BV-Amsterdam	8,000	....	....
Total Raffinaderij Nederland NV-Vlissingen	150,000	....	² 14,000
Total	1,551,500	115,000	178,900

NETHERLANDS ANTILLES			
Lago Oil & Transport CL-Aruba	420,000	....	....
Shell Curacao NV-Curacao	320,000	40,000	15,000
Total	740,000	40,000	15,000

NEW ZEALAND			
New Zealand Refining-Whangarei	74,000	....	24,000

NICARAGUA			
Esso Standard SA Ltd.-Managua	15,000	....	¹ 3,000
Total	15,000	....	3,000

NIGERIA			
Nigerian Petroleum Refining CL-Kaduna ¹	95,000	18,900	² 15,750
Port Harcourt, Alesa Elemo	57,000	....	¹ 5,400
Warri	95,000	¹ 22,500	² 15,300
Total	247,000	41,400	36,450

Solvent extraction: ¹13,600 b.cd.

NORWAY			
AS Norske Esso-Slagentangen	90,000	....	² 9,000
Valloy	2,700	....	....
AS Norske Shell-Sola	60,000	....	10,000
Rafinor AS-Mongstad	90,000	....	² 10,000
Total	242,700	....	29,000

OKINAWA			
Nansei Sekiyu KK-Nishihara	45,000	....	¹ 9,600
Nippon Petroleum Refining CL-Nakagusuku	8,000	....	² 2,000
Okinawa Sekiyu Seisei-Yonashiro	100,000	....	....
Total	153,000	....	11,600

OMAN			
Oman Refinery Co.-Mina Al Fahal	48,082	....	² 9,644

PAKISTAN			
Attock Refinery Ltd.-Rawalpindi	36,000	....	....
National Refinery Ltd.-Korangi, Karachi	45,450	....	² 2,210
Pakistan Refinery Ltd.-Karachi	45,000	....	² 2,850
Total	126,450	....	5,060

PANAMA			
Refineria Panama SA-Las Minas	100,000	....	² 7,500
Total	100,000	....	7,500

REFINING

Company and refinery location	Crude	Catalytic cracking	Catalytic reforming
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PARAGUAY

Petróleos Paraguayos-Villa Elisa	7,500		
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PERU

Petróleos del Peru:			
Iquitos, Loreto	9,860		
La Pampilla, Lima	93,900	¹ 6,510	² 1,640
Marsella, Loreto	1,315	....	....
Pucallpa	2,440	....	....
Talara	61,035	¹ 15,440	....
Total	168,550	21,950	1,640

PHILIPPINES

Bataan Refining Corp.-Limay	155,000	² 8,000	¹ 23,800
Caltex (Philippines) Inc.-Batangas	63,000	¹ 8,100	² 8,100
Pilipinas Shell Petroleum-Tabangao	68,000	....	8,300
Total	286,000	16,100	40,200

POLAND

Government-owned refineries at Czechowice, Gdansk, Glinik Mariampolski, Jasto, Jealcoze, Kralaty, L. Warynski, Plock, Trzebinia. Of these, Plock is by far the largest, accounting for roughly 80% of Polish refinery production. Its crude capacity is nearly 300,000 b/d.

Total	385,000		
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PORTUGAL

Petrolgal-Leça da			
Palmeira, Porto	81,000		¹ 10,669
Sines	200,822		² 27,500
Total	281,822	....	38,169

PUERTO RICO

Caribbean Gulf Refining Corp.-			
Bayamón	36,000	¹ 12,000	² 5,800
Yabucoa Sun Oil Co.-Yabucoa	85,000	....	....
Total	121,000	12,000	5,800

QATAR

National Oil Distribution Co.-			
Umm Said	63,200	....	² 11,830
Total	63,200	....	11,830

RUMANIA

Government-owned refineries at Bacau, Borzesti, Brazi, Brazov, Cimpina, Darmanesti, G. Gheorghiu Dej, Navodari, Onesti, Pitesti, Ploesti, Sulpacu, and Tulaejen.

Total	617,000		
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SAUDI ARABIA

Arabian American Oil Co.-			
Ras Tanura	470,000		
Jeddah Oil Refinery-Jeddah	90,000	¹ 10,000	² 3,000
Riyadh Oil Refinery-Riyadh	130,000	....	....
Yanbu Domestic Refinery-Yanbu	170,000	....	² 35,000
Total	860,000	10,000	38,000

SENEGAL

Ste. Africaine de Raffinage-			
MBao (Dakar)	18,000	....	1,900

SIERRA LEONE

Sierra Leone Petroleum Refining			
Co.-Freetown	10,000	....	....

SINGAPORE

BP Refinery Singapore PL			
Pasir Panjang	28,000	....	....
Esso Singapore PL-Pulau Ayer			
Chawan	250,000	....	¹ 9,000
Mobil Oil Singapore PL-Jurong	193,000	....	¹ 3,000
			² 10,000
Shell Eastern Petroleum Ltd.-			
Pulau Bukom	460,000	....	17,000

Company and refinery location	Crude	Catalytic cracking	Catalytic reforming
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Singapore Refinery CL-			
Pulau Merlimau	170,000		¹ 12,000
Total	1,101,000		51,000

SOMALIA

Iraqsoma Ref. Co.-Mogadishu	10,000		
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SOUTH AFRICA

Calrex Oil SA PL-Cape Town	90,000	¹ 25,000	² 10,500
Mobil Oil Refining Co.-			
Southern Africa PL-Durban	65,000	¹ 15,000	² 19,000
National Petroleum Refiners of			
South Africa PL-Sasolburg OFS	78,500	¹ 18,500	² 11,500
Shell and BP South Africa			
Petroleum Refineries PL-Durban	155,000	¹ 24,000	² 21,000
Total	388,500	82,500	62,000

†South African Oil Refinery PL is owner; Mobil is operator. \$1-1-84 figures unavailable.

SPAIN

Asfaltos Españoles SA-Tarragona	21,000	....	....
Cia. Española de Petróleos-San Roque			
(Cádiz)	176,000	....	² 35,000
Tenerife	176,000	....	² 19,000
Cia. Ibérica Refinadora de			
Petróleos-La Coruña	140,000	¹ 25,000	¹ 22,000
EMP-Cartagena, Murcia	180,000	....	² 25,000
Puertollano, Ciudad Real	135,000	¹ 23,500	² 18,000
Tarragona	225,000	....	² 16,000
Petróleos del Mediterraneo-			
Castellón de la Plana	120,000	¹ 15,000	² 13,100
Petronor SA-Somorrostro, Vizcaya	240,000	....	² 33,500
Unión Explosivos Rio Tinto SA-			
La Rábida, Huelva	80,000	....	² 14,100
Total	1,493,000	63,500	195,700

SRI LANKA

Ceylon Petroleum Corp.-			
Sapugaskanda	50,000		² 3,750
Total	50,000		3,750

SUDAN

Port Sudan Refinery Ltd.-Port Sudan	24,000		¹ 2,100
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SWEDEN

AB Nynas Petroleum-Gothenburg	7,500		
Malmö	2,300		
Nynashamn	45,000		² 4,400
BP Raffinaderi-Gothenburg	106,000	....	² 24,500
Shell Raffinaderi AB-			
Gothenburg	82,000	....	17,000
Skandinaviska Raffinaderi AB-			
Brofjorden-Lysekil	210,000	....	² 36,000
Total	452,800	....	81,900

SWITZERLAND

Raffinerie de Cressier SA-			
Cressier	65,000	....	15,000
Raffinerie du Sud-Ouest SA-			
Collombey	72,000	....	² 10,000
Total	137,000	....	25,000

SYRIA

Banias Refining Co.-Banias	126,350	....	² 16,728
Homs Refinery Co.-Homs	102,440	....	² 2,620
Total	228,790	....	19,348

TANZANIA

Tanzanian & Italian Petroleum			
Refining CL-Kigamboni, Dar es			
Salaam	17,000	....	² 4,200

Company and refinery location	Crude	Catalytic cracking	Catalytic reforming
THAILAND			
Esso Standard Thailand Ltd.-Chonburi	46,000	.....	¹ 6,700
Petroleum Authority of Thailand-Bangchak, Bangkok	65,000	.....	² 10,500
Thai Oil Refinery CL-Sriracha, Chonburi	65,000	¹ 8,800	² 2,900 ² 5,800
Total	176,000	8,800	25,900

TOGO

Ste. Togolaise des Hydrocarbures-Lome	20,000		⁴ 4,400
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TRINIDAD

Texaco Trinidad Inc.-Pointe-a-Pierre	275,000	¹ 25,000	² 20,000
Trinidad and Tobago Oil CL-Point Fortin	100,000		¹ 7,000
Total	375,000	25,000	27,000

TUNISIA

Ste. Tunisienne Industries des Raffinage-Bizerte	34,000		3,300
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TURKEY

Anadolu Tasliyehanesi AS-Mersin	90,000		² 10,500
Istanbul Petrol Rafinerisi AS-Izmit	270,000	¹ 25,000	² 24,000
Turkish Petroleum Corp.-Aliaga	92,378	¹ 12,660	² 8,200
Batman	20,082	² 3,600	² 1,175
Total	472,460	41,260	43,875

UNITED KINGDOM

England			
Conoco Ltd.-South Killingholme	130,000	.....	² 64,000
Esso Petroleum CL-Fawley	304,000	76,500	² 27,900
Lindsey Oil Refinery Ltd.-Killingholme, South Humberside	190,000	¹ 35,000	² 33,600
Mobil Oil CL-Coryton, Essex	145,000	¹ 36,000	² 27,000
Phillips Imperial Petroleum Ltd.-Port Clarence	100,000	.....	.....
Philmac Oils Ltd.-Eastham, Cheshire	12,000	.....	.....
Shell U.K. Ltd.-Shell Haven	175,000	.....	48,000
Stanlow	256,000	52,000	38,000
Teesport	104,000	.....	15,000
Total	1,416,000	199,500	276,000

Scotland

BP Refinery Grangemouth Ltd.-Grangemouth	173,000	¹ 17,000	² 23,000
Shell U.K. Ltd.-Ardrossan	5,500	.....	.....
Total	178,500	17,000	23,000

Wales

Amoco UK Ltd.-Milford Haven	102,000	¹ 31,500	² 17,500
BP Refinery Llandarcy Ltd.-Llandarcy, Neath	112,000	¹ 18,000	² 11,000
Gulf Oil Refining Ltd.-Milford Haven	103,000	.....	² 22,000

Company and refinery location	Crude	Catalytic cracking	Catalytic reforming
Pembroke Cracking Co. (65% Texaco, 35% Gulf)			
Texaco Ltd.-Pembroke, Dyfed	180,000	¹ 75,000	² 20,000
Total	497,000	124,500	78,500
Total United Kingdom	2,091,500	341,000	389,500

URUGUAY

Administración Nacional de Combustibles, Alcohol y Portland-La Teja, Montevideo	45,000	¹ 5,000	¹ 3,000
Total	45,000	5,000	3,000

U.S.S.R.

Government owned refineries at Achinsk, Angarsk, Baku, Batumi, Drogobych, Fergana, Gorki, Grozny, Guryev, Ishimbei, Khabarovsk, Kherison, Kishini, Komosomolsk, Krasnovodsk, Kremenchug, Kuibyshev, Lisichansk, Mazheikiai, Moscow, Mozyr, Nadvornaya, Nizhnekamsk, Odessa, Omsk, Orsk, Pavlodar, Perm, Polotsk, Ryazan, Saratov, Syzran, Tuapse, Ufa, Ukhta, Vannovskiy, Volgograd, and Yaroslavl.

Total **11,750,000**

VENEZUELA

Corpoven-Bajo Grande	57,000	.....	.....
El Palito	100,000	¹ 39,100	¹ 6,000
El Toren	4,500	.....	.....
Lagoven-Amuay Bay	600,000	¹ 71,300	.....
Maraven-Punta Cardon	265,000	¹ 57,000	.....
Meneven-Puerto La Cruz	192,500	¹ 11,400	.....
San Roque	5,200	.....	.....
Total	1,224,200	178,800	6,000

VIRGIN ISLANDS

Hess Oil Virgin Islands Corp.-St. Croix	600,000	.....	² 125,000
Total	600,000		125,000

YEMEN, S.

Aden Refinery Co.-Little Aden ¹	178,000		¹ 12,000
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¹Solvent extraction 8,150 b/d

YUGOSLAVIA

Bosanski Brod	43,129		² 6,360
Lendava	13,180		
Novi Sad	11,100	.....	.....
Pancevo	29,878	.....	3,996
Rijeka	160,000	.....	18,500
Sisak	38,800	¹ 1,960	16,300
Zagreb	600	.....	.....
Total	296,687	1,960	45,156

ZAIRE

Soc. Zairo-Italienne de Raffinage-Muanda	17,000	.....	² 3,000
Total	17,000	.....	3,000

ZAMBIA

Indeni Petroleum Refinery CL-Bwana Nkubwa Area, Ndola	24,500		⁴ 5,600
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UNITED STATES

Survey of operating refineries in the U.S.
(state capacities as of January 1, 1984)

State	No. plants	Crude capacity b/cd	Cat cracking Fresh feed	Cat reforming
Alabama	3	144,500	.....	26,000
Alaska	4	139,000	.....	10,000
Arkansas	4	66,170	17,500	9,000
California	38	2,484,693	578,500	555,350
Colorado	3	83,900	23,000	20,400
Delaware	1	140,000	62,000	77,000
Georgia	2	28,800	.....	.....
Hawaii	2	109,500	22,000	13,000
Illinois	8	964,500	374,000	310,400
Indiana	5	467,400	167,000	106,200
Kansas	7	319,927	132,000	86,700
Kentucky	2	214,500	100,000	46,000
Louisiana	19	2,172,793	772,900	464,000
Maryland	1	14,200	.....	.....
Michigan	4	118,000	45,000	33,000
Minnesota	2	202,550	78,000	52,000
Mississippi	6	377,400	74,000	95,800
Montana	6	147,000	50,700	41,000
Nevada	1	4,500	.....	.....
New Jersey	5	503,000	229,000	125,500
New Mexico	6	108,095	27,700	21,700
North Dakota	2	60,800	26,000	12,000
Ohio	5	514,300	185,700	159,700
Oklahoma	9	416,700	143,300	108,500
Oregon	1	15,000	.....	.....
Pennsylvania	9	718,550	255,300	209,900
Tennessee	1	57,000	30,000	8,000
Texas	40	4,423,550	1,523,100	1,087,400
Utah	7	163,975	54,800	28,000
Virginia	1	52,000	28,000	9,000
Washington	7	407,900	91,500	100,800
West Virginia	2	16,500	.....	4,400
Wisconsin	1	39,000	9,500	9,800
Wyoming	6	167,180	69,500	31,350
Total	220	15,862,883	5,170,000	3,862,800

U.S. refineries

Company and refinery location	Crude	Catalytic cracking	Catalytic reforming
ALABAMA			
Hunt Oil Co.—Tuscaloosa	44,500	.....	² 6,000
Louisiana Land & Exploration Co.—Saraland	80,000	.....	² 20,000
Mobile Bay Refining Co.—Chickasaw	20,000	.....	.....
Total	144,500	.....	26,000
ALASKA			
Atlantic Richfield Co.—Prudhoe Bay	22,000	.....	.....
Chevron U.S.A. Inc.—Kenai	22,000	.....	.....
Mapco Petroleum Inc.—North Pole	46,500	.....	.....
Tesoro Petroleum Corp.—Kenai	48,500	.....	² 10,000
Total	139,000	.....	10,000
ARKANSAS			
Berry Petroleum, subsidiary of Crystal Oil Co.—Stevens	3,500	.....	.....
Cross Oil & Refining Co. of Arkansas—Smackover	9,800	.....	.....
Macmillan Ring-Free Oil Co.—Norphlet	5,870	.....	.....
Tosco Corp.—El Dorado	47,000	¹ 17,500	² 9,000
Total	66,170	17,500	9,000
CALIFORNIA			
Anchor Refining Co.—McKittrick	10,000	.....	.....
Atlantic Richfield Co.—Carson	215,000	¹ 58,000	² 38,000
Beacon Oil Co.—Hanford	17,880	.....	² 3,650
Champion Petroleum Co.—Wilmington	60,000	¹ 30,000	² 12,000
Chevron U.S.A. Inc.—Bakersfield	26,000	.....	² 6,000
El Segundo	405,000	¹ 63,000	² 60,000
Richmond	365,000	¹ 63,000	² 84,000
Conoco Inc.—Santa Maria	9,500	.....	.....
Eco Petroleum Inc.—Signal Hill	NR	.....	.....
Edgerton Oil Co.—Long Beach	36,900	.....	.....
Exxon Co.—Benicia	109,000	¹ 55,000	² 26,000
Fletcher Oil & Refining Co.—Carson	29,500	¹ 10,000	² 4,200
Getty Refining & Marketing Co.—Bakersfield	50,900	.....	² 9,200
Golden Bear Division, Witco Chemical Corp.—Oildale	10,318	.....	.....
Golden Eagle Refining Co.—Carson	16,500	.....	.....
Golden West Refining Co.—Santa Fe Springs	40,600	¹ 13,500	² 19,000
Huntway Refining Co.—Benicia	NR	.....	.....
Wilmington	5,425	.....	.....
Independent Valley Energy Co.—Bakersfield	NR	.....	.....
Kern County Refinery Inc.—Bakersfield	21,400	.....	² 3,000
Macmillan Ring-Free Oil Co.—Signal Hill	13,000	.....	.....
Marlex Oil & Refining Inc.—Long Beach	NR	.....	.....
Mobil Oil Corp.—Torrance	123,500	¹ 61,000	² 36,000
Newhall Refining Co.—Newhall	21,400	.....	¹ 2,300
Oxnard Refinery—Oxnard	4,700	.....	.....
Pacific Oasis—Paramount	46,500	.....	² 11,500
Pacific Refining Co.—Hercules	55,000	.....	² 15,000
Powerine Oil Co.—Santa Fe Springs	44,120	¹ 12,000	² 7,500
Sabre Refining Inc.—Bakersfield	10,000	.....	.....
San Joaquin Refining Co.—Bakersfield	12,000	.....	.....
Shell Oil Co.—Martinez	91,400	¹ 60,000	² 23,000
Wilmington	108,000	¹ 35,000	² 24,000
Sunland Refining Corp.—Bakersfield	15,000	.....	² 1,500
Texaco Inc.—Wilmington	75,000	¹ 28,000	² 35,000
Tosco Corp.—Martinez	126,000	¹ 45,000	² 8,700
Total	2,484,693	578,500	555,350
UNITED STATES TOTAL			
Union Oil Co. of California—Los Angeles	108,000	¹ 45,000	² 49,000
Rodeo	111,000	.....	² 28,000
USA Petrochem Co.—Ventura	27,900	.....	² 7,500
Total	2,484,693	578,500	555,350

Solvent extraction: ¹50,000 b/cd.

Company and refinery location	Crude	Catalytic cracking	Catalytic reforming
COLORADO			
Asamera Oil U.S. Inc.—Commerce City	NR	¹ 8,000	² 10,000
Conoco Inc.—Commerce City	32,500	¹ 15,000	² 7,000
Gary Refining Co.—Fruita	13,400	.....	² 3,400
Total	83,900	23,000	20,400

DELAWARE			
Getty Refining and Marketing Co.— Delaware City	140,000	¹ 62,000	² 42,000 ³ 35,000
Total	140,000	62,000	77,000

GEORGIA			
Amoco Oil Co.—Savannah	24,000	.....	.....
Young Refining Corp.—Douglasville	4,800	.....	.....
Total	28,800	.....	.....

HAWAII			
Chevron U.S.A. Inc.—Barber's Point	48,000	¹ 22,000	.....
Hawaiian Independent Refinery Inc.—Ewa Beach	61,500	.....	² 13,000
Total	109,500	22,000	13,000

ILLINOIS			
Calumet Industries Inc.—Burnham	.....	.....	.....
Clark Oil & Refining Corp.—Blue Island Hartford	57,000 47,500	¹ 25,000 ¹ 27,000	² 30,500 ² 12,000
Marathon Oil Co.—Robinson	195,000	¹ 38,000	¹ 12,400 ³ 35,000

Mobil Oil Corp.—Joliet	180,000	¹ 98,000	² 46,000
Shell Oil Co.—Wood River	250,000	¹ 94,000	² 22,000 ³ 68,000
Texaco Inc.—Lawrenceville	84,000	¹ 34,000	² 24,000
Union Oil Co. of California—Lemont	151,000	¹ 58,000	² 30,500
Total	964,500	374,000	310,400

INDIANA			
Amoco Oil Co.—Whiting	376,000	¹ 140,000	³ 94,000
Gladioux Refinery Inc.—Ft. Wayne	18,600	.....	.....
Indiana Farm Bureau Cooperative Association Inc.—Mt. Vernon	20,600	¹ 7,000	⁴ 3,500
Laketon Refining Corp.—Laketon	9,000	.....	.....
Rock Island Refining Corp.— Indianapolis ¹	43,200	¹ 20,000	² 8,700
Total	467,400	167,000	106,200

Solvent extraction: ¹4,500.

KANSAS			
Derby Refining Co.—Wichita	28,800	² 17,000	² 7,000
Farmland Industries Inc.—Coffeyville	56,500	¹ 23,000	² 16,000
Phillipsburg	26,400	¹ 8,500	¹ 5,300
Getty Refining & Marketing Co.— El Dorado	80,577	¹ 31,000	² 25,000
National Cooperative Refinery Association—McPherson	54,150	¹ 20,000	² 13,000
Pester Refining Co.—El Dorado ¹	31,000	¹ 14,500	² 5,000
Total Petroleum Inc.—Arkansas City	42,500	¹ 18,000	¹ 16,300
Total	319,927	132,000	87,600

Solvent extraction: ¹5,200 b.s.d.

KENTUCKY			
Ashland Petroleum Co.—Catlettsburg ¹	NR	¹ 60,000 ¹ 40,000	² 19,000 ² 27,000

Company and refinery location	Crude	Catalytic cracking	Catalytic reforming
Somerset Refinery Inc.—Somerset	5,500	.....	² 1,000
Total	214,500	100,000	46,000

Solvent extraction: ¹10,000 b.s.d. [†]Reduced crude converter

LOUISIANA			
Atlas Processing Co., Division of Pennzoil—Shreveport ¹	76,500	.....	² 15,000
Calumet Refining Co.—Princeton	4,000	.....	.....
Canal Refining Co.—Church Point	7,858	.....	¹ 1,600
Cameron Oil & Gas Co.—Mermentau	14,000	.....	.....
CITGO Petroleum Corp.—Lake Charles	320,000	¹ 150,000	² 46,000 ³ 45,000
Claiborne Gasoline Co.—Lisbon	NR	.....	² 2,000
Conoco Inc.—Lake Charles	156,500	¹ 30,600	² 15,000 ⁴ 12,400
Cotton Valley Refinery (Kerr-McGee Refining Corp.)—Cotton Valley	NR	.....	.....
CPI Refining Inc.—Lake Charles	10,000	.....	.....
Exxon Co.—Baton Rouge ²	455,000	¹ 155,000	¹ 95,000
Gulf Products Co.—Belle Chasse	198,500	¹ 89,000	² 40,000
Hill Petroleum Co.—Krotz Springs	48,000	¹ 28,000	² 12,000
Marathon Oil Co.—Garyville	255,000	¹ 75,000	² 50,000
Murphy Oil USA Inc.—Meraux ³	90,200	¹ 35,300	⁵ 21,000
Placid Refining Co.—Port Allen ⁴	NR	¹ 17,500	² 7,000
Port Petroleum Inc.—Stonewall	3,200	.....	.....
Shell Oil Co.—Norco	218,000	¹ 100,000	³ 28,000
Tenneco Oil Co.—Chalmette	114,000	¹ 22,500	² 28,000
Texaco Inc.—Convent	140,000	¹ 70,000	² 30,000
Total	2,172,793	772,900	464,000

Solvent extraction: ¹7,100 b.s.d. ²6,900 b.s.d. ³12,000 b.s.d. ⁴5,000 b.s.d.

MARYLAND			
Chevron U.S.A. Inc.—Baltimore	14,200	.....	.....
MICHIGAN			
Crystal Refining Co.—Carson City	4,000	.....	.....
Lakeside Refining Co.—Kalamazoo	5,600	.....	² 2,000
Marathon Oil Co.—Detroit	68,500	¹ 27,000	² 17,000
Total Petroleum Inc.—Alma	NR	¹ 18,000	¹ 14,000
Total	118,000	45,000	33,000

MINNESOTA			
Ashland Petroleum Co.—St. Paul Park	NR	¹ 23,000	² 13,000
Koch Refining Co.—Rosemount	137,000	¹ 55,000	³ 13,000 ² 26,000
Total	202,550	78,000	52,000

[†]Dimersol

MISSISSIPPI			
Amerada-Hess Corp.—Purvis	30,000	² 18,000	² 5,800
Chevron U.S.A. Inc.—Pascagoula	295,000	¹ 56,000	² 90,000
Ergon Refining Inc.—Vicksburg	20,600	.....	.....
Natchez Refining Inc.—Natchez	15,000	.....	.....
Southland Oil Co.—Lumberton	5,800	.....	.....
Sandersville	11,000	.....	.....
Total	377,400	74,000	95,800

MONTANA			
Conex—Laurel ¹	40,400	¹ 12,000	² 12,000
Conoco Inc.—Billings	48,500	¹ 15,500	² 15,800
Exxon Co.—Billings	42,000	¹ 21,000	¹ 10,000
Flying J Inc.—Cut Bank	5,600	.....	² 2,200
Kenco Refining Inc.—Wolf Point	4,200	.....	.....
Simmons Refining Corp.—Black Eagle	6,300	¹ 2,200	² 1,000
Total	147,000	50,700	41,000

Solvent extraction: ¹4,000 b.s.d.

REFINING

Company and refinery location	Crude	Catalytic cracking	Catalytic reforming
NEVADA			
Nevada Refining Co.—Tonopah	4,500	.....	.....
NEW JERSEY			
Chevron U.S.A. Inc.—Perth Amboy	168,000	³ 33,000	² 39,000
Exxon Co.—Linden	100,000	¹ 120,000	² 25,000
Mobil Oil Corp.—Paulsboro	100,000	¹ 36,000	² 23,500
Seaview Petroleum Inc.—Thorofare	45,000	.....	.....
Texaco Inc.—Westville	90,000	¹ 40,000	² 38,000
Total	503,000	229,000	125,500

NEW MEXICO			
Caribou Four Corners Inc.—Kirtland	2,200	.....	⁴ 1,500
Giant Industries Inc.—Gallup	18,000	¹ 7,200	² 6,800
Navajo Refining Co.—Artesia	NR	¹ 14,500	¹ 1,800
Plateau Inc.—Bloomfield	NR	¹ 6,000	² 3,100
Southern Union Refining Co.—Lovington	36,100	.....	.....
Thrifty Way Co.—Bloomfield	6,100	.....	⁴ 2,500
Total	108,095	27,700	21,700

NORTH DAKOTA			
Amoco Oil Co.—Mandan	56,000	¹ 26,000	⁴ 10,000
Flying J Inc.—Williston	4,800	.....	⁴ 2,000
Total	60,800	26,000	12,000

OHIO			
Ashtand Petroleum Co.—Canton	NR	¹ 25,000	⁶ 20,000
Gulf Oil Products Co.—Cincinnati	43,700	¹ 18,000	² 11,000
Standard Oil Co. of Ohio—Lima	168,000	¹ 37,700	³ 47,000
Toledo	120,000	¹ 55,000	³ 40,700
Sun Cl-Toledo ¹	118,000	¹ 50,000	² 41,000
Total	514,300	185,700	159,700

Solvent extraction: ¹11,000 b/d.

OKLAHOMA			
Allied Materials Corp.—Stroud	7,900	.....	.....
Champion Petroleum Co.—Enid	53,800	¹ 19,500	² 15,000
Conoco Inc.—Ponca City	134,000	¹ 45,000	² 33,500
Kerr-McGee Refining Corp.—Wynnewood ¹	43,000	¹ 20,000	² 8,500
Oklahoma Refining Co.—Cyril ¹	9,200	6,800	² 6,000
Thomas ¹	9,800	.....	.....
Sun Cl—Tulsa ²	85,000	¹ 30,000	² 23,000
Tonkawa Refining Co.—Arnett ¹	12,000	.....	.....
Total Petroleum Inc.—Ardmore	62,000	¹ 22,000	¹ 22,500
Total	416,700	143,300	108,500

Solvent extraction: ¹5,000 b/d. ²5,900 b/d. †Figures taken from EIA report.

OREGON			
Chevron U.S.A. Inc.—Portland	15,000	.....	.....

PENNSYLVANIA			
Atlantic Richfield Co.—Philadelphia	125,000	¹ 29,000	² 60,000
BP Oil Corp.—Marcus Hook	168,000	¹ 48,000	⁵ 50,000
Gulf Oil Products Co.—Philadelphia ¹	174,100	¹ 85,300	² 32,000
Kendall-Amalie Division, Witco Chemical Co.—Bradford	7,600	.....	² 2,000
Pennzoil Products Co.—Rouseville	15,700	.....	² 3,600
Quaker State Oil Refining Corp.—Farmers Valley	6,500	.....	² 2,000
Sun Cl—Marcus Hook	155,000	¹ 75,000	¹ 13,100
United Refining Co.—Warren	60,000	¹ 18,000	² 16,000
Valvoline Oil Co., Division of Ashland Oil Co.—Freedom	NR	.....	.....
Total	718,550	255,300	209,900

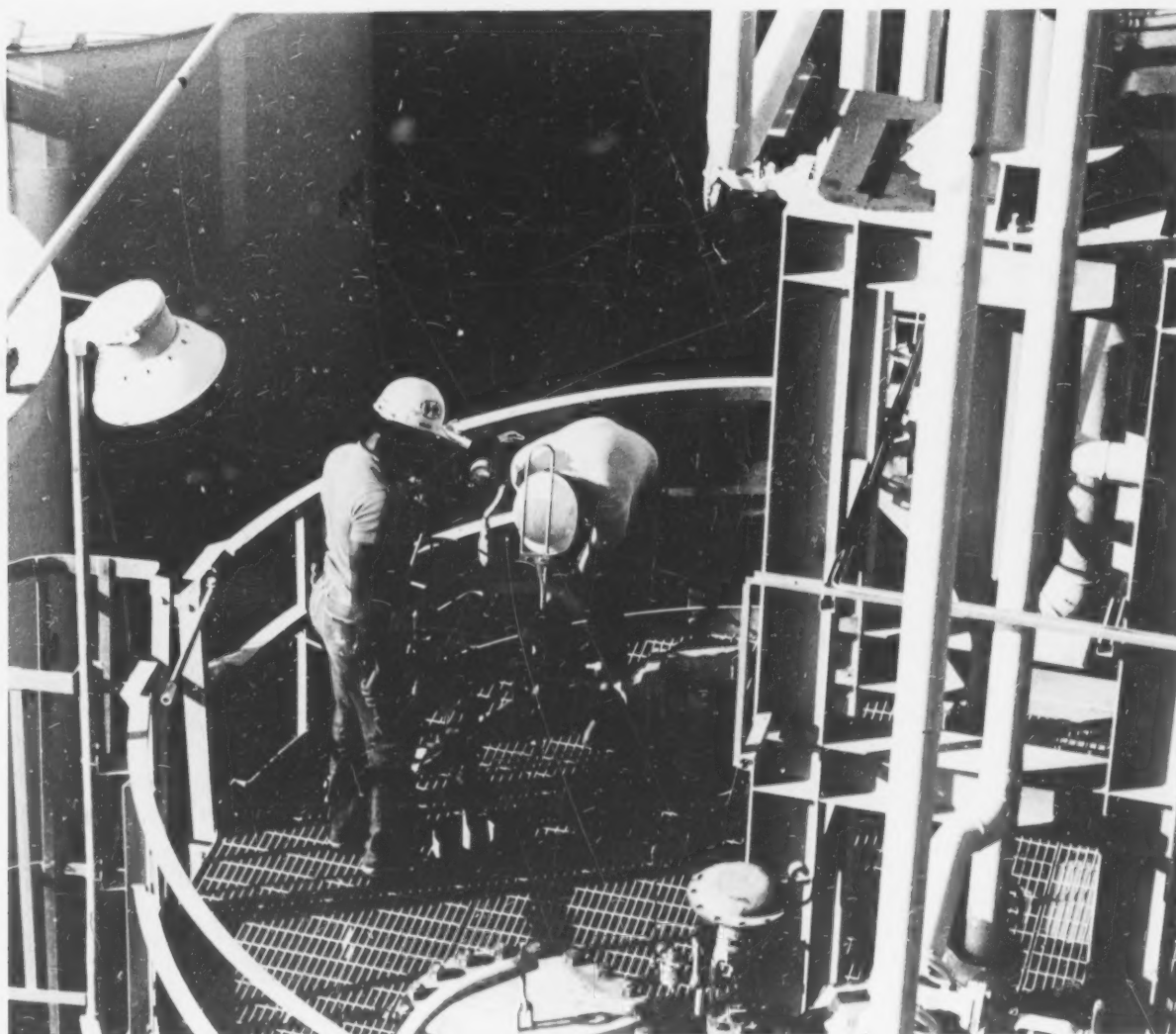
Solvent extraction: ¹16,000 b/d.

Company and refinery location	Crude	Catalytic cracking	Catalytic reforming
TENNESSEE			
Mapco Petroleum Inc.—Memphis	NR	¹ 30,000	² 8,000
Total	57,000	30,000	8,000

TEXAS			
Amber Refining Co.—Fort Worth	14,500	¹ 5,000	¹ 1,700
American Petroleum Inc.—Big Spring ¹	NR	¹ 23,500	⁶ 20,000
Port Arthur	90,000	¹ 36,000	² 25,000
Amoco Oil Co.—Texas City	415,000	¹ 194,000	⁴ 152,000
Atlantic Richfield Co.—Houston	233,000	¹ 78,000	² 68,000
Champion Petroleum Co.—Corpus Christi	173,000	¹ 69,000	⁵ 50,000
Chatter International Oil Co.—Houston ²	NR	.....	² 13,500
Chevron U.S.A. Inc.—El Paso	76,000	¹ 22,000	² 25,000
Coastal States Petroleum Co.—Corpus Christi	95,000	¹ 19,500	⁶ 20,000
Crown Central Petroleum Corp.—Houston	100,000	¹ 56,000	² 14,000
Diamond Shamrock Corp.—Sunray ³	71,100	¹ 45,000	² 16,000
Three Rivers ⁴	47,000	¹ 17,000	² 8,000
Dorchester Refining Co.—Mt. Pleasant	26,500	² 9,600	² 3,500
Eddy Refining Co.—Houston	3,500	.....	⁴ 1,500
Exxon Co. U.S.A.—Baytown ²	494,000	¹ 155,000	⁴ 123,000
Flint Chemical Co.—San Antonio	1,200	.....	.....
Gulf Oil Products—Port Arthur ⁶	406,900	¹ 110,000	² 40,500
Howell Hydrocarbons Inc.—San Antonio	9,600	.....	⁶ 1,200
Koch Refining Co.—Corpus Christi	105,000	¹ 28,500	¹ 12,000
LaGloria Oil & Gas Co.—Tyler	65,000	¹ 17,000	² 7,000
Liquid Energy Corp.—Bridgeport	10,000	.....	.....
Marathon Oil Co.—Texas City	69,500	¹ 38,000	¹ 8,000
Mobil Oil Corp.—Beaumont	270,000	¹ 102,000	² 102,000
Phillips Petroleum Co.—Borger	95,000	¹ 60,000	¹ 7,000
Sweeny	175,000	¹ 87,000	² 36,000
Pride Refining Inc.—Arlene	42,750	.....	.....
Quintana Petrochemical Co.—Corpus Christi	NR	.....	¹ 16,000
Saber Energy Inc.—Corpus Christi	NR	¹ 41,500	.....
Shell Oil Co.—Deer Park	250,000	¹ 60,000	² 15,000
Odessa	30,600	¹ 10,500	³ 40,000
South Hampton Refining Co.—Silsbee	19,000	.....	¹ 11,000
Southwestern Refining Co.—Corpus Christi	104,000	¹ 50,000	² 30,000
Tesoro Petroleum Corp.—Carrizo Springs	26,100	.....	² 3,000
Texaco Inc.—Amarillo	20,000	¹ 8,000	¹ 5,000
El Paso	17,000	¹ 7,000	² 3,500
Port Arthur ⁷	402,000	¹ 135,000	² 20,000
Port Neches	31,000	.....	.....
Texas City Refining Inc.—Texas City	119,600	.....	.....
Texas Oil & Chemical Terminal Inc.—Vidor	19,000	.....	.....
Union Oil Co. of California—(Beaumont), Nederland	120,000	39,000	³ 34,000
Total	4,423,550	1,523,100	1,087,400

UTAH			
Amoco Oil Co.—Salt Lake City	40,000	¹ 18,000	¹ 6,000
Caribou Four Corners Inc.—Woods Cross	8,400	.....	² 2,500
Chevron U.S.A.—Salt Lake City	45,000	¹ 11,000	² 5,500
Crysen Refining Inc.—Woods Cross	12,500	.....	² 3,000
Husky Oil Co.—North Salt Lake City	25,000	² 4,400	² 5,000
Phillips Petroleum Co.—Woods Cross ¹	25,000	² 8,400	⁶ 6,000
Plateau Inc.—Roosevelt	NR	¹ 6,000	.....
Total	163,975	54,800	28,000

Solvent extraction: ¹10,000 b/d. ²10,000 b/d. ³11,000 b/d. ⁴7,000 b/d. ⁵49,000 b/d. ⁶31,100 b/d. ⁷12,000 b/d. †Heavy oil cracker.



Company and refinery location	Crude	Catalytic cracking	Catalytic reforming
VIRGINIA			
Amoco Oil Co.—Yorktown	52,000	¹ 28,000	² 9,000
Total	52,000	28,000	9,000

WASHINGTON			
Atlantic Richfield Co.—Ferndale	144,000	.....	² 43,000
Chevron U.S.A. Inc.—Seattle	5,500	.....	.....
Mobil Oil Corp.—Ferndale	71,500	² 25,500	⁴ 11,800
Shell Oil Co.—Anacortes	72,000	¹ 36,000	³ 20,000
Sound Refining Inc.—Tacoma	11,900	.....	.....
Texaco Inc.—Anacortes ¹	78,000	¹ 30,000	² 20,000
U.S. Oil & Refining Co.—Tacoma	25,000	.....	² 6,000
Total	407,900	91,500	100,800

Solvent extraction: ¹7,400 b/sd.

WEST VIRGINIA			
Quaker State Oil Refining Corp.—			
Newell	11,700	.....	² 3,200
St. Mary's	4,800	.....	² 1,200
Total	16,500	.....	4,400

Company and refinery location	Crude	Catalytic cracking	Catalytic reforming
WISCONSIN			
Murphy Oil USA Inc.—Superior	39,000	¹ 9,500	¹ 9,800
Total	39,000	9,500	9,800

WYOMING			
Amoco Oil Co.—Casper	48,000	¹ 13,500	⁴ 6,000
Husky Oil Co.—Cheyenne	28,800	¹ 12,000	¹ 1,000
Little America Refining Co.—Casper	24,500	¹ 12,500	² 5,500
		² 6,500	² 6,100
Mountaineer Refining Co.—LaBarge	NR	.....	.....
Sinclair Oil Corp.—Sinclair	53,000	¹ 21,000	¹ 10,000
Wyoming Refining Co.—Newcastle	12,500	² 4,000	¹ 2,750
Total	167,100	69,500	31,350

Export Oriented Refineries in Middle East (Capacity in Thousand Barrels per Calendar Day)

Company and Location	Crude Atmosph	Distillation Vacuum	Catalytic Reforming	Catalytic Cracking	Hydro Cracking	Visbreaking Start Up	Planned
Bahrain							
BPC (Awali)	250	150	17	34	—	19	On stream
Saudi Arabia							
Aramco (Ras Tanura)	450	100	60	—	—	—	On stream
Petromin-Petrola (Rabigh)	325	—	70	—	—	—	1984
Petromin-Shell (Al Jubail)	250	100	15	—	45	35	1984
Petromin-Mobil (Yanbu)	250	100	32	66	—	40	1985
Saudi Arabia Subtotal	1275	300	177	66	45	75	
Kuwait							
KNPC (Mina Abdullah)	140	— 75	— —	— —	— 40	— —	On stream** 1986 (expansion)
KNPC (Mina Al Amhadi)	250 20	10 80	33 —	— —	— 38	— 30	On stream 1985 (expansion)
KNPC (Shuaiba)	190	130	15	—	103*	—	On stream
Kuwait Subtotal	600	295	48	—	181	30	
TOTAL	2125	745	242	100	226	124	

* 56 vacuum distillates, 47 vacuum resid

** 30 resid hydrodesulfurization

Source: Petroleum Industry Research Foundation Inc.

Saudi Arabia's Petromin, it is believed, will stick to its policy of selling crude and products and not getting involved in local marketing.

There also is greater confidence that none of the Middle East exporters wants to undermine the European products market. They saw crude prices drop in 1982 after cheap products were dumped on the spot market.

Petromin, in selling products from its new refineries, was looking for long term deals. It apparently aims to use the spot market only as a last resort.

All the indications are that Petromin wants to sell products at market prices and maximize its return on refinery investments. But it would prefer to cut overall refinery throughput rather than get into price cutting.

OPEC countries which have made vast investments to build new refineries will have to balance their expanded processing capacity and its effect on the petroleum market and the internal structure of OPEC.

Crude export cut. Saudi Arabia and Kuwait are expected to progressively reduce crude exports as they add to export refinery capacity.

If all of OPEC follows that policy, keeping total petroleum exports con-

stant, the effect of 1 million b/d of additional products exports would be a 20¢/bbl increase in the price of refined oil.

The decline in crude exports would produce a higher crude price, which would support a higher refined oil prices.

But they warn that expansion of products exports by OPEC has several potential effects on the internal structure of the organization.

Another consideration is the likelihood that as soon as products become a significant portion of OPEC oil exports, the product exporting members of the organization will have a dual pricing objective for the cartel, while the crude exporting countries will be concerned only with the crude oil market.

This would add to the incongruity of members views on prices, in turn reducing the probability of reaching a consensus.

Turnaround. In 1973, before the first round of big crude oil price increases by OPEC, Europe was a major exporter of products.

Its massive refinery industry had a salable surplus of about 500,000 b/d.

The latest study of the refining industry by the European Economic Community shows that in 1982 Europe was

importing 480,000 b/d of products.

This turnaround stemmed partly from a 10% reduction in the international products trade but mostly from increased imports from a wide range of sources, including the U.S., Spain, Algeria, and the Soviet Union.

The EEC study says the U.S.S.R. has played a major role in boosting European products imports. Its shipments to the EEC are three times those of the next largest supplier.

By 1981 net imports had risen to 300,000 b/d. But last year there was an enormous 180,000 b/d growth due largely to what the EEC study describes as "the anomalous relationship between prices for crude oil and products."

Many producers from OPEC and non-OPEC countries, in a bid to increase sales in a weak market, offered products manufactured in their own or third party refineries at prices equal to a value for crude much below its official price.

EEC says, seems unlikely that the unusual price relationships of 1982 and early 1983 can become a lasting feature of the market, although they might well recur from time to time.

Discounted products prices eventually undermine official crude oil prices, as

Non-Communist pipeline construction in 1984

Area	Larger than				Total
	4-10 in.	12-20 in.	22-30 in.	30 in.	
Miles					
GAS PIPELINES					
U.S.	1,548	923	1 107	1,859	5,437
Canada	183	229	7	542	961
Latin America	923	335	1,334	—	2,592
Asia-Pacific	219	110	952	357	1,638
Western Europe	—	416	579	900	1,895
Middle East	309	499	—	410	1,218
Africa	61	86	—	568	715
Total gas	3,243	2,598	3,979	4,636	14,456
CRUDE PIPELINES					
U.S.	51	59	1,350	—	1,460
Canada	145	269	—	—	414
Latin America	75	237	—	—	312
Asia-Pacific	22	490	—	—	512
Western Europe	—	—	—	—	—
Middle East	62	106	669	146	983
Africa	5	—	450	—	455
Total crude	360	1,161	2,469	146	4,136
PRODUCT PIPELINES					
U.S.	203	715	120	196	1,234
Canada	35	101	—	—	136
Latin America	240	240	—	—	480
Asia-Pacific	122	—	—	—	122
Western Europe	6	159	—	—	165
Middle East	249	122	—	—	371
Africa	2	—	—	—	2
Total products	857	1,337	120	196	2,510
NON-COMMUNIST WORLD TOTALS					
Gas	3,243	2,598	3,979	4,636	14,456
Crude	360	1,161	2,469	146	4,136
Products	857	1,337	120	196	2,510
Total	4,460	5,096	6,568	4,978	21,102

Panhandle Eastern plans a 105 mile gas line linking the Matagorda Island area off Texas with the mainland. The Mantaray Pipeline, as it will be known, would be built in two phases, an 87 mile section of 24 and 36 in. line linking four offshore blocks with the existing Trunkline Gas Co. line in Victoria County.

The first section of Mantaray could be completed late in 1984 or early in 1985. A second phase would extend the line to a fifth block. Capacity of the completed system will be 278 billion cu ft/year.

Also off Texas, Seagull Transmission Co., Houston, is completing the first 55 mile section of its 258 mile, 24 in. system paralleling the Texas Gulf Coast from Cameron to Galveston counties.

Initial capacity of the first segment, laid off Port O'Connor, Tex., will be 200 MMcf/d.

The Trans-Anadarko Pipeline System proposes a 468 mile system of 36 in. pipe from Custer County, Okla., to West Monroe Junction, La., with a 167 mile, 36 in. branch to Moore County, Tex. Total cost of the system would be about \$700 million.

Niagara Interstate Pipeline System

trimmed the size of its proposed 161 mile line from Niagara Falls, N.Y., to a storage field at Tamarack, Pa.

Canada's National Energy Board approved reduced volumes of gas to be sold to the line, which is now to have 36-42 in. pipe, rather than 42-48 in., and a capacity of 1.3 billion cfd instead of 2.5 billion cfd. Estimated cost has been cut to \$322 million from \$464 million.

U.S. crude lines. There are still plans for an west-east crude pipeline link in the U.S., despite the death of the Northern Tier project.

This time the proposed lines would cross the southwestern states.

Celeron Corp.'s All-American Pipeline Co. has received some of the permits it will need to build. It has won approval from the Bureau of Land Management to cross federal land and from the California State Lands Commission to cross California state land.

All-American, Dallas, wants to build a \$600 million, 30 in., 1,100 mile line from a new Getty line at Taft, Calif., to existing lines south of Odessa, Tex. Capacity would be 300,000 b/d.

The Getty line would extend inland



NATURAL GAS SERVICE was extended to Canada's maritime provinces through this Trans Quebec & Maritimes Pipeline Inc. system. Here, the line is being lowered into the East Humber River near Toronto.

from its existing Gaviota marine terminal.

A second southern route proposal, put forward by Pacific Texas Pipeline Co., Long Beach, Calif. is for a 1,026 mile, 42 in. crude line.

To be financed by a group of private investors, PacTex would carry 900,000 b/d from a new tanker terminal at Long Beach, Calif., to Midland.

Cost of the project would be about \$1.5 billion.

To get shipper support, both lines must beat the economics of the successful trans-Panama line.

The PacTex proposal for a Long Beach terminal is similar to one put forward several years ago by Standard Oil Co. (Ohio). Sohio scrapped its project in 1979 when it couldn't get all regulatory approvals required for the terminal.

Both of the systems hope to be on stream by 1986.

Meanwhile, units of Atlantic Richfield Co. and Chevron U.S.A. Inc. have started planning an onshore California pipeline to move Santa Maria basin/Santa

PIPELINING

Barbara Channel crude to Chevron and ARCO refineries in Los Angeles.

The 24 in. line would cost \$200-300 million and go into service no sooner than late 1987.

The partners are trying to decide which of four routes the line will take. Length would vary from 135 miles to 250 miles, depending upon the route chosen. The longer, inland route could include a spur to serve San Francisco area refineries.

U.S. products lines. Transgulf Pipeline Co. has one of the major products pipeline projects under way in the U.S.

Transgulf will convert to products use a 24 in. gas line it purchased from Florida Gas Transmission Co. and maintain gas service in a 30 in. line currently looped to the 24 in. system.

About 445 miles of pipe will be laid in connection with the project.

The products line will carry about 250,000 b/d, expandable to 350,000 b/d.

About 360 miles of new 30 in. pipe will be laid on the system to close the existing 30 in. system and to lay new loops on the gas line. Also, 85 miles of new spur lines, including a 16 in., 63 mile line from Brooker to Jacksonville, Fla., will be added to the products line.

Completion of the \$400 million project is expected in 1986.

Canadian action. Canada's pipeline activity also is expected to be slow in 1984, due in part to the U.S. gas market slump and resulting lower export volumes.

Canada has several major gas pipeline proposals working in addition to its share of the Ansts system.

Foothills Pipelines Ltd. proposes a 2,028 mile line of 42, 48, and 56 in. pipe from the Yukon border to Monchy, Sask.

Cost would be about \$4.4 billion, and completion could come in 1989.

The Polar Gas Project would move gas from the Mackenzie Delta/Beaufort Sea region to southern Canada and U.S. markets.

Completion of the \$10.6 billion, 32 in., 800 MMcf/d line isn't expected until the early 1990s. Project sponsors have delayed filing an application with the federal government until the first half of this year. The delay is intended to allow the gas market to stabilize before work proceeds on the proposal.

Smaller projects going through the government application process are a 16 in., 242.3 mile, Westcoast Transmission Co. Ltd., Vancouver, line from Williams Lake to Powell River, B.C., and a 132 mile, 12 in. line from Little River to Langford, B.C. Completion of both is expected in late 1985.

Canada's biggest proposed crude line is a 1,400 mile, 42 in. project by Esso Resources Canada Ltd. from the Mackenzie River Delta to northern Alberta.

The line would start at Richards Is-

Non-Communist pipeline construction in 1984 and beyond*

Area	Larger than				Total
	4-10 in.	12-20 in.	22-30 in.	30 in.	
Miles					
GAS PIPELINES					
U.S.	1,568	1,030	1,482	3,723	7,803
Canada	210	560	573	3,388	4,731
Latin America	923	826	1,521	267	3,537
Asia-Pacific	219	137	965	357	1,678
Western Europe	—	664	1,034	903	2,601
Middle East	309	748	—	410	1,467
Africa	261	86	—	1,135	1,482
Total gas	3,490	4,051	5,575	10,183	23,299
CRUDE PIPELINES					
U.S.	51	67	1,350	—	1,468
Canada	245	538	—	1,400	2,183
Latin America	75	237	—	—	312
Asia-Pacific	22	490	—	—	512
Western Europe	—	—	—	—	—
Middle East	62	106	809	146	1,123
Africa	5	—	900	—	905
Total crude	460	1,438	3,059	1,546	6,503
PRODUCT PIPELINES					
U.S.	203	1,303	123	391	2,020
Canada	35	101	—	—	136
Latin America	868	397	—	—	1,265
Asia-Pacific	122	—	—	—	122
Western Europe	6	159	—	—	165
Middle East	249	122	—	—	371
Africa	386	—	—	—	386
Total products	1,869	2,082	123	391	4,465
NON-COMMUNIST WORLD TOTALS					
Gas	3,490	4,051	5,575	10,183	23,299
Crude	460	1,438	3,059	1,546	6,503
Products	1,869	2,082	123	391	4,465
Total	5,819	7,571	8,757	12,120	34,267

* Projects planned and under way.

land, near Tuktoyaktuk, N.W.T.

It would be an alternative to the proposed use of icebreaking tankers to move Beaufort Sea production south.

Interprovincial Pipeline Ltd. expects to complete a 538 mile, 12 in. crude line from Norman Wells, N.W.T., to Zama Lake, Alta., late in 1985. Cost of the project will be about \$576 million.

Latin America. Argentina's new government plans a pipelaying program that would pace Latin American action. But the country's troubled economy will make financing difficult.

Gas del Estado plans to lay 227 miles of 8 in. line and 186 miles of 6 in. line from General San Martin and Centro Oeste to La Pampa.

Set for completion in 1985 is a 365 mile, 8 in. gas line from Plaza Hincul to Bariloche, and a 490 mile, 6-10 in. gas line from Sante Fe to Entre Rios.

Argentina currently flares much of its gas.

To the north, Snamprogetti is proceeding with engineering for a proposed 1,165 mile, 28-30 in. gas line from Santa Cruz, Bolivia, to Sao Paulo, Brazil.

Bolivia would be responsible for 343 miles of the line, with the balance in

Brazil.

Brazil's Petroleo Brasileiro SA expects to complete the 254 mile Nordeste gas pipeline from gas fields off Rio Grande do Norte state, along the Brazilian coast, to Recife late in 1984.

Colombia's Ecopetrol expects to complete two 18 in. products lines in June. One is a 120 mile line from Barranca-bermeja to Ayacucho, the second an 80 mile line from Covenas to Cartagena.

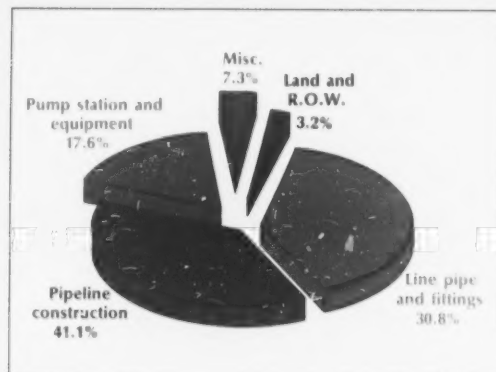
As in much of Latin America, economic problems continue to hamper Mexico's ambitious pipeline construction plans.

Petroleos Mexicanos has about 2,200 miles of various products lines in the planning stage and about 945 miles of gas lines planned for its already extensive gas network.

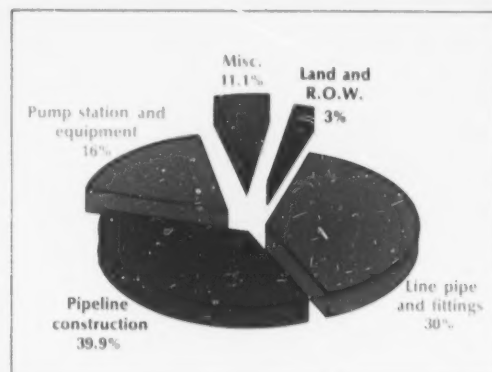
Biggest gas project would be a 416 mile, 16 in. line between Naco-Cananea to Hermosillo to Ciudad Obregon on Pemex's northern system.

Costa Rica's Ministry of Industry, Energy, and Mines has invited bids for design, financing, and construction of a 100 mile crude oil pipeline between the deepwater ports of Puerto Mogos on the Pacific coast and Puerto Moin on the

Investment split—crude oil pipelines



Investment split—products pipelines



Construction Report (OGJ, Oct. 24, 1982) lists a total of 76 individual pipeline projects totaling more than 8,700 miles of pipeline either planned or under way for the U.S. Natural gas line projects add up to 58 projects involving more than 4,600 miles of pipeline, either planned or under way. Products pipeline projects are second in number, with 11 projects comprising 1,594 miles, and crude oil pipeline projects are third in number (seven projects) but second in number of miles of pipeline planned or under way, 2,481 miles.

U.S. interstate pipeline network. One measure of the U.S. interstate pipeline network is a tabulation compiled from reports filed with FERC by the regulated interstate liquids and gas pipelines for 1982. As indicated and shown in Table 1, the total mileage adds up to 459,548 miles. This breaks down to 172,549 miles of liquids pipelines and 286,999 miles of natural gas pipelines.

Reports filed at the end of 1981 show a total of 447,449 miles, including 172,815 miles of liquids pipelines and 274,634 miles of natural gas pipelines. The mileages for 1982 and 1981 are not directly comparable, as the number of companies required to file reports with FERC varies slightly each year. The mileage for 1982 represents 139 liquids pipeline companies and 103 natural gas companies, while the mileage for 1981 represents 132 liquids pipeline companies and 104 natural gas companies.

At the end of 1982, the reports from the liquids pipeline companies show a total of 35,580 miles of gathering lines, 59,567 miles of crude oil trunk lines, and 77,402 miles of products lines.

Similarly, reports filed for 1982 by the interstate natural gas pipelines show a total of 204,896 miles of transmission lines, 76,073 miles of field lines, and 6,030 miles of storage lines.

Crude oil, products, and natural gas delivered. An analysis of the reports filed with FERC for 1982 shows that the 139 liquids pipelines delivered 5.9 billion bbl of crude oil and 4.2 billion bbl of refined products for a total of 10.1 billion bbl of liquid hydrocarbons. The trunkline traffic totaled 1,938,173 million bbl-miles of crude oil and 1,484,370 million bbl-miles of products, for a total trunkline traffic of 3,422,370 million bbl-miles, which was a decrease of 131,154 million bbl-miles or 3.7%, compared to the amount reported for 1981.

For the same period in 1981, the 133 liquids lines reporting delivered almost 6.1 billion bbl of crude oil and more than 4.1 billion bbl of products, for a total of more than 10.2 billion bbl of crude oil and products, or about 0.4% over that delivered in 1982. Natural gas sales by the 115 natural gas firms reporting for 1982 was 16.4 trillion cu ft, compared to 18.5 trillion cu ft sold by the 104 gas firms reporting for 1981, or a decrease of 2.1 trillion cu ft or 11.4%.

Pipeline investment and revenue. The interstate common-carrier crude oil and products pipeline companies reported an investment in carrier property for 1982 of \$21.9 billion, compared to \$21.5 billion for 1981, an increase of \$692 million or 3.3%.

Operating revenue reached \$7.1 billion in 1982 for the liquids pipeline companies. This is an increase of more than \$462 million, or 6.9%, compared to 1981. The liquids pipeline companies reporting to FERC for 1982 showed a net income of \$2.16 billion for 1982, compared to \$2.03 billion for 1981, or an increase of \$137.8 million, or 6.5% compared to 1981. Net income as a percentage of investment in carrier property was 9.9% in 1982 compared to 9.6% in 1981.

The interstate natural gas companies

Table 1
U.S. interstate pipeline mileage

Year	Miles		
	Gas	Liquid	Total
1972	246,551	173,532	420,083
1973	248,773	170,691	419,464
1974	246,872	173,341	420,213
1975	255,792	172,680	428,472
1976	254,548	174,072	428,590
1977	256,198	170,948	427,146
1978	258,576	162,452	421,028
1979	264,134	169,794	433,928
1980	274,248	172,673	446,921
1981	274,634	172,815	447,449
1982	286,999	172,549	459,548

Source: FERC Form 6 Reports—liquid pipelines; Form 2 Annual Reports—gas pipelines.

under the jurisdiction of FERC reported an industry gas plant investment total of more than \$43 billion at the end of 1982 compared to more than \$39.1 billion at the end of 1981. This represents an increase for 1982 of \$3.9 billion, or 10% compared to 1981.

These companies reported an operating revenue total of more than \$64.8 billion for 1982, compared to \$57.8 billion in 1981, for the reporting companies. They reported a total net income of \$3.5 billion for 1982, compared to \$3.8 billion in 1981, for the reporting companies. Net income as a percentage of gas plant investment stood at 8.3% for 1982, compared to 9.7% for 1981.

As shown in Table 2, the investment in the five crude oil pipelines stood at \$1,493 million at the end of 1982, which compares with \$1,477 million for 1981, for an increase of \$15.4 million or an increase of just over 1%.

The investment in the five products

Table 2

Investment in liquids pipelines

Item	Company and investment, \$					Total, \$	Percent
	A	B	C	D	E		
CRUDE PIPELINES INVESTMENT BY FIVE COMPANIES							
Land	2,078,308	895,858	294,320	716,419	1,111,353	5,096,268	0.34
Right of way	12,080,048	1,237,937	316,178	15,442,156	14,260,782	43,337,101	2.90
Line pipe	130,336,748	31,096,721	12,803,882	89,865,223	147,999,532	412,102,106	27.61
Line pipe fittings	6,804,032	2,030,480	1,893,683	15,652,476	21,787,180	48,167,851	3.23
Pipeline construction	178,028,447	33,357,341	17,161,510	196,762,794	187,006,233	612,316,325	41.01
Buildings	10,074,088	5,504,171	2,466,823	11,190,863	7,573,924	36,809,869	2.47
Pumping equipment	17,366,926	6,719,413	2,582,712	15,754,167	44,967,015	87,390,233	5.85
Machine tools and machinery .....	.....	.....	.....	33,140	1,170	34,310	....
Other station equipment	62,774,449	18,659,594	4,126,583	34,193,334	18,574,736	138,328,696	9.26
Oil tanks	13,600,550	8,608,551	5,678,530	15,735,859	23,363,369	66,986,859	4.49
Delivery facilities .....	.....	1,805,853	5,236,237	2,383,963	6,025,621	15,451,674	1.03
Communication systems .....	.....	2,316,632	4,709	9,070,923	2,260,827	13,653,081	0.91
Office furniture & equipment	308,383	189,398	149,231	472,801	721,762	1,841,575	0.12
Vehicles & other work equip.	4,764,607	1,623,123	400,680	4,616,637	179,095	11,584,142	0.78
Other property .....	.....	.....	.....	.....	50,223	50,223	....
Total	439,216,586	114,045,082	53,115,078	411,890,755	475,886,822	1,493,154,323	100.00
PRODUCT PIPELINES INVESTMENT BY FIVE COMPANIES							
Land	4,350,611	1,757,007	364,027	852,997	2,513,001	9,837,643	0.36
Right of way	27,558,629	10,803,656	16,833,290	8,363,989	6,438,095	69,997,659	2.59
Line pipe	338,096,130	67,537,825	103,814,831	85,180,505	102,228,193	696,857,484	25.80
Line pipe fittings	70,988,291	12,517,090	13,447,175	1,570,379	14,661,418	113,184,353	4.19
Pipeline construction	551,483,249	108,211,163	186,441,549	92,909,847	138,128,093	1,077,173,901	39.88
Buildings	22,497,635	3,751,475	3,853,078	9,891,416	15,131,219	55,124,823	2.04
Pumping equipment	44,452,463	5,720,747	28,993,922	27,611,061	21,206,389	127,984,582	4.74
Machine tools & machinery .....	.....	.....	.....	.....	241,030	241,030	0.01
Other station equipment	112,327,924	19,998,025	29,231,691	22,688,694	64,010,122	248,256,456	9.19
Oil tanks	47,540,012	16,834,568	6,698,890	17,187,305	35,289,608	123,550,383	4.57
Delivery facilities .....	.....	.....	9,449,769	10,616,501	33,499,844	53,566,114	1.98
Communication systems	709,020	251,206	1,881,395	7,720,104	—	10,561,725	0.39
Office furniture & equipment	9,592,390	1,175,399	962,103	461,241	377,318	12,568,451	0.47
Vehicles & other work equip.	4,199,837	1,338,687	4,724,617	1,682,387	1,037,045	12,982,573	0.48
Other property	73,102,438	.....	16,320,107	.....	.....	89,422,545	3.31
Total	1,306,898,629	249,896,848	423,016,444	286,736,426	434,761,375	2,701,309,722	100.00

Source: FERC Form 6 pipeline annual reports—1982.

lines was just over \$2,701 million at the end of 1982, compared to \$2,636 million at the end of 1981, an increase of just over \$65.6 million or 2.5% during 1982.

Figs. 1 and 2 illustrate the major investment split in the crude oil and products pipeline companies. The major investment is in pipeline construction: 41.1% for the crude oil pipelines and 39.9% for the products pipelines. Line pipe and fittings account for about 30% for both crude oil and products pipeline investment, while pump stations and equipment account for 17.6% of the investment in crude oil pipelines and 16% for products pipelines.

Construction costs. As Figs. 1 and 2 show, the cost of line pipe and fittings and the cost of laying pipelines add up to 70-72% of the cost of a pipeline system. These elements of pipeline

construction costs continue to rise each year. The OGJ-Morgan Oil Pipeline Index for 1982 and the OGJ-Morgan Gas Pipeline Cost Index for 1982 show that the composite oil pipeline cost index increased from 150 at the end of 1978 to 210 at the end of 1982, an increase of 40% in 4 years, while the composite gas pipeline cost index rose from 122 in 1978 to 190 at the end of 1982, an increase of almost 56%. These data indicate that, if inflation continues, the cost of constructing pipelines could double in 4-5 years.

Table 3 lists a 10 year onshore construction cost trend for natural gas pipelines, for diameters ranging from 8-36 in. As the table reflects, the average cost per mile for any given diameter may increase or decrease from one year to the next, due to such elements

as terrain, population density, and other variables affecting construction cost. Still, the 10 year trend shows a continual rise from one year to the next in average construction cost per mile. In Table 4 is a list of 46 pipeline construction projects onshore and 18 offshore. The onshore projects represent 1,886.7 miles of pipeline at an estimated price tag of more than \$2,235 million, and the offshore pipeline projects represent 218.3 miles of offshore pipeline with an estimated price tag of more than \$273 million. The pipeline projects represent the major construction permit applications for natural gas pipelines filed with FERC from June 1, 1982, to June 1, 1983.

The pipelines are listed in order of increasing diameter and in increasing lengths within each pipeline diameter.

Table 3

10-year onshore construction cost trend

Size	Fiscal year*	Average cost, \$ mile				Range \$ mile	
		R O W	Material	Labor	Misc	Total	Low High
8-in.	1983	6,244	48,392	89,600	23,088	167,324	159,940 178,020
	1982	3,730	45,219	122,860	14,629	186,438	134,830 201,206
	1981	8,119	34,860	23,528	20,884	87,391	55,981 109,078
	1980	8,247	39,040	102,839	13,036	163,162	149,926 200,554
	1979	1,189	40,692	63,518	14,951	123,350	50,374 581,916
	1978	1,590	32,123	30,554	8,660	72,927	61,614 109,956
	1977	1,403	34,423	27,002	8,963	71,791	28,844 126,063
	1976	....	....	....	....	....	....
	1975	2,561	11,948	29,915	8,732	53,155	37,898 75,896
	1974	1,504	11,785	19,242	1,599	34,130	(†) (†)
12-in.	1983	5,135	91,492	73,042	20,754	190,423	177,050 218,365
	1982	15,794	160,146	174,016	72,294	422,432	233,220 600,610
	1981	3,855	71,444	65,613	11,861	152,773	55,981 369,018
	1980	2,610	54,235	41,089	14,111	112,045	78,428 901,282
	1979	1,590	46,062	47,283	7,121	102,056	96,822 158,185
	1978	6,697	55,362	61,919	13,830	137,808	(†) (†)
	1977	4,332	34,429	22,658	4,573	65,992	53,839 177,694
	1976	....	....	....	....	....	....
	1975	2,135	20,908	24,401	3,396	50,841	44,909 52,249
	1974	2,400	18,570	28,385	2,725	52,080	(†) (†)
16-in.	1983	31,542	337,088	929,969	278,159	1,576,758	447,890 2,370,748
	1982	8,286	128,016	82,504	56,856	276,002	197,384 376,572
	1981	9,203	110,684	133,968	40,424	294,279	140,674 590,112
	1980	7,404	74,571	57,681	18,050	157,706	118,085 471,972
	1979	....	....	....	....	....	....
	1978	7,506	54,936	54,117	12,552	129,111	86,898 203,721
	1977	3,635	50,574	32,260	9,347	95,817	68,897 145,916
	1976	3,248	80,373	26,575	9,419	119,615	(†) (†)
	1975	1,512	29,290	19,629	4,367	54,798	45,001 121,922
	1974	2,251	22,464	32,020	10,135	66,870	45,040 112,613
20-in.	1983	12,682	147,354	154,811	46,073	360,934	237,600 476,104
	1982	15,244	171,368	149,933	68,173	404,713	313,069 557,655
	1981	8,556	122,659	114,147	30,370	275,732	227,679 1,741,597
	1980	11,470	130,438	73,751	48,213	263,872	157,947 533,265
	1979	....	....	....	....	....	....
	1978	3,235	101,052	83,810	12,346	200,443	153,959 242,685
	1977	5,415	95,045	85,842	16,044	202,346	110,349 312,337
	1976	....	....	....	....	....	....
	1975	7,258	53,951	37,251	18,134	116,593	101,674 155,982
	1974	6,356	49,152	96,168	14,712	163,388	118,231 219,835
24-in.	1983	31,416	310,583	504,401	148,993	995,393	608,781 1,649,454
	1982	12,194	149,075	118,593	72,694	352,556	(†) (†)
	1981	30,078	269,414	395,204	127,790	822,486	350,898 826,088
	1980	14,220	162,019	152,406	52,114	380,759	230,122 820,295
	1979	5,268	152,878	193,227	19,206	370,579	(†) (†)
	1978	2,372	112,790	125,435	17,045	257,642	239,480 371,932
	1977	....	....	....	....	....	....
	1976	4,784	95,656	94,319	29,755	224,514	(†) (†)
	1975	4,306	75,126	38,115	18,189	135,736	130,939 139,833
	1974	3,944	53,295	29,764	13,047	100,794	89,495 148,841
30-in.	1983	23,872	253,071	348,478	116,084	741,506	660,086 1,683,143
	1982	37,210	336,461	242,747	104,168	720,586	476,944 1,363,650
	1981	14,135	309,364	201,037	73,281	597,817	561,358 4,684,745
	1980	13,206	227,229	134,491	46,018	420,944	319,482 921,772
	1979	25,884	239,454	290,474	35,752	591,560	529,178 604,298
	1978	12,231	187,718	216,264	20,895	437,108	(†) (†)
	1977	6,485	147,814	91,862	22,469	268,630	266,513 270,684
	1976	22,456	112,497	96,141	19,750	250,844	168,029 471,679
	1975	17,267	92,819	123,824	19,981	261,730	179,445 414,866
	1974	9,766	98,123	64,677	21,706	194,289	120,270 281,075
36-in.	1983	51,436	498,047	490,568	306,666	1,346,717	703,112 2,724,493
	1982	21,410	440,211	342,750	75,820	880,190	643,548 1,414,851
	1981	5,948	344,374	358,072	74,415	782,809	693,945 1,573,759
	1980	20,677	344,664	268,753	87,850	721,944	528,710 1,105,515
	1979	20,654	272,397	203,639	57,814	554,504	443,024 682,280
	1978	26,441	199,878	150,667	65,439	442,425	(†) (†)
	1977	20,101	209,878	115,498	18,366	363,843	(†) (†)
	1976	....	....	....	....	....	....
	1975	12,567	118,579	94,095	10,929	236,170	194,960 355,962
	1974	7,350	121,715	79,025	24,551	232,641	204,841 288,668

* 1974-1978 based on completed costs reported to FERC by fiscal year; 1979-1981 by calendar year. 1982-83 based on FERC Construction Permit Applications, by fiscal year. † One report only.

Table 4

Current pipeline costs

Size, in.	Location	Miles	Material	Labor	Misc. †	R.O.W. & damages	Total	\$ mile
ONSHORE PIPELINES								
6	Connecticut*	1.70	59,000	684,000	102,206	171,000	1,136,064	668,273
6	Texas*	3.10	5,000	101,550	44,000	40,000	190,550	61,468
6	New York	13.50	498,000	1,117,800	151,400	85,000	1,852,300	137,207
6	Oklahoma Kansas§	17.80	366,400	836,690	101,040	50,000	1,353,130	76,019
6	New York	28.90	1,544,000	2,745,800	377,700	192,000	4,859,500	168,149
8	Colorado	26.60	1,257,500	2,337,500	1,001,410	150,000	4,746,410	178,436
8	Pennsylvania	39.70	1,951,200	3,603,000	531,400	264,000	6,349,600	159,940
10	New Jersey	2.70	613,411	4,547,410	1,315,626	135,249	6,616,696	2,413,027
10	Louisiana	13.94	2,621,680	2,360,580	1,193,110	557,630	6,733,000	482,999
10	Wyoming	35.00	1,627,000	1,112,000	316,100	38,400	3,093,500	88,386
10	Oklahoma Kansas§	12.90	559,090	875,970	122,070	33,840	1,590,970	123,331
12	Tennessee	2.40	179,390	265,110	66,377	13,000	523,837	218,265
12	Montana	5.00	437,650	275,400	87,200	25,000	888,250	177,050
14	Illinois Iowa	6.70	638,000	1,130,000	650,000	82,000	2,500,000	373,134
16	Michigan	6.50	3,893,000	2,599,000	1,032,948	115,000	7,639,948	463,027
16	New York	7.30	1,047,300	1,938,000	201,300	83,000	3,269,600	447,890
16	Pennsylvania*	13.44	4,241,970	20,794,677	6,341,991	661,215	31,862,853	2,370,748
20	Missouri	5.00	619,000	436,000	93,000	40,000	1,188,000	237,600
20	New York	7.70	1,420,600	1,964,078	196,046	85,276	3,666,000	476,104
20	Utah	43.50	6,094,315	6,145,523	2,254,156	574,772	15,068,766	346,408
24	New Jersey*	37.83	14,287,695	33,617,108	13,579,318	1,847,079	62,466,504	1,651,243
24	Pennsylvania*	64.00	17,339,000	17,746,000	2,525,000	1,352,000	38,962,000	608,781
30	Louisiana	0.90	460,410	517,000	261,900	30,500	1,269,800	1,410,900
30	West Virginia*	10.60	3,419,000	4,078,500	2,397,420	135,000	10,030,120	946,237
30	Pennsylvania							
	New Jersey	16.25	11,415,000	15,458,000	2,165,000	452,000	29,490,000	1,683,143
30	New Jersey*	17.90	6,750,000	12,883,000	4,922,286	2,802,000	27,357,286	1,528,340
30	Pennsylvania*	80.50	44,123,000	51,243,000	12,456,000	2,253,000	110,681,000	1,374,919
30	Colorado	162.20	60,185,000	37,710,000	13,279,231	3,570,000	114,744,231	707,424
30	Colo., Utah, N.M.	177.20	51,465,000	40,344,500	31,840,463	1,871,174	125,521,137	708,359
36	Louisiana*	3.66	1,402,000	1,172,000	237,797	157,400	2,969,197	811,256
36	Louisiana*	5.05	2,107,500	1,580,000	338,382	217,200	4,243,082	840,214
36	Iowa Illinois	10.45	3,498,000	2,859,000	1,294,024	567,000	7,867,024	752,825
36	Texas*	23.00	10,511,000	5,336,000	3,600,000	661,000	20,130,000	874,522
36	Texas	23.51	10,053,000	5,283,000	3,656,000	676,000	19,688,000	836,580
36	Michigan*	20.60	7,631,600	5,654,600	996,300	131,300	14,443,800	703,112
36	New Jersey*	21.31	13,811,133	31,935,605	11,271,415	1,040,794	58,058,947	2,724,493
36	West Virginia*	26.40	13,172,600	12,119,500	2,014,900	172,300	27,479,300	1,040,883
36	Pennsylvania*	36.42	23,344,779	19,241,415	10,664,554	1,026,880	54,277,628	1,490,325
36	Maine, N.H., Mass., R.I.	360.00	184,608,245	189,014,728	136,913,598	25,381,340	535,917,911	1,488,660
36	Colo., Utah, N.M.	65.80	26,795,500	18,280,500	11,823,377	694,826	57,594,203	875,292
42	Pennsylvania	38.60	28,653,600	21,185,500	17,576,391	803,100	68,218,591	1,767,321
42	New Jersey Penn-sylvania*	57.51	67,866,422	38,086,643	26,383,851	2,238,082	134,574,998	2,340,028
42	Pennsylvania*	60.60	61,918,876	40,417,340	25,019,648	1,658,908	129,014,772	2,128,957
42	New York Penn-sylvania	74.10	54,674,100	40,515,400	34,464,995	1,541,900	131,196,395	1,770,532
42	New York Penn-sylvania	158.00	142,556,331	89,702,744	76,550,044	3,810,570	312,619,689	1,978,606
48	New York	48.60	63,537,000	35,140,000	32,685,139	4,121,000	135,483,139	2,787,719
* Loop § Replacement.								
OFFSHORE PIPELINES								
6	Louisiana	0.89	318,350	1,036,490	330,270	1,350	1,686,460	1,894,900
8	Louisiana	1.74	547,000	3,003,000	417,000	2,000	3,969,000	2,281,034
10	Louisiana	2.90	721,000	5,366,000	856,000	2,000	6,945,000	2,394,828
12	Texas	1.10	591,770	1,503,320	496,010	1,250	2,592,350	2,356,682
12	Louisiana	2.78	1,233,330	3,565,080	984,820	1,250	5,775,480	2,077,511
12	Louisiana	3.80	1,138,030	5,973,445	1,897,025	1,000	9,009,500	2,370,921
12	California	8.20	3,390,000	8,649,000	3,209,000	—	15,248,000	1,859,512
12	Louisiana	11.40	2,492,000	6,273,000	1,813,000	2,000	14,549,000	1,276,228
12	Louisiana	15.90	3,842,100	9,251,400	2,934,199	2,000	16,089,699	1,011,930
16	Texas	6.00	2,318,520	3,579,240	1,269,180	1,250	7,168,190	1,194,698
16	Texas	9.50	2,123,780	5,698,241	1,183,605	21,364	9,017,990	945,262
16	Louisiana	10.20	3,556,403	7,778,854	2,834,472	1,000	14,170,729	1,389,287
20	Texas	20.30	7,285,920	6,622,860	3,218,580	1,250	17,128,610	843,744
20	Louisiana	28.28	8,767,660	8,560,460	4,016,600	4,170	21,348,890	759,911
20	Texas	32.64	10,013,700	11,044,900	6,475,900	1,500	27,536,000	843,627
24	Texas	3.00	1,100,000	2,700,000	1,220,000	—	5,020,000	1,673,333
30	Texas	30.12	22,062,000	15,456,000	8,800,000	1,000	46,326,000	1,538,048
36	Texas*	32.53	25,788,300	18,408,500	10,203,500	1,200	54,401,900	1,672,361

Source: FERC Construction Permit applications, 6/1/82-6/1/83. * Loop.

† Includes engr., supv., surveying, interest, adm. & overhead, contingencies, and FERC fees.

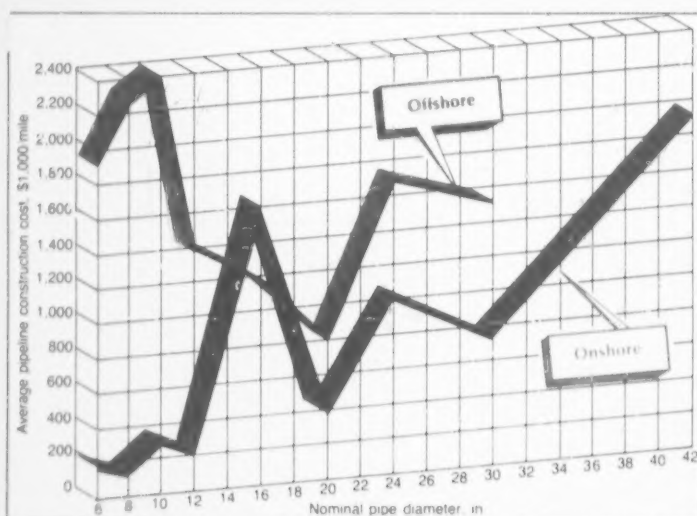
Table 5

Current compressor station costs

Location	Horsepower	Equipment & material	Labor	Land	Misc. †	Total	\$ hp
ONSHORE							
Pennsylvania*	375	469,000	269,000	—	91,400	829,400	2,212
North Dakota	526	880,000	136,000	60,000	101,500	1,177,500	2,239
Pennsylvania§	540	73,200	141,600	—	28,700	243,500	451
West Virginia*	1,160	697,000	254,000	—	74,900	1,025,900	884
Pennsylvania*	1,160	710,000	231,000	—	84,000	1,025,000	884
Wyoming*	2,000	980,000	100,000	10,000	160,000	1,250,000	625
Utah*	2,000	2,075,000	1,500,000	—	150,000	3,725,000	1,863
Texas	2,920	2,947,000	600,000	30,000	1,423,876	5,000,876	1,713
Utah	3,830	1,690,663	378,816	—	465,496	2,534,975	662
Connecticut*	3,830	3,977,400	3,448,600	—	974,000	8,400,000	2,193
Colorado	3,830	2,242,000	1,353,000	100,000	180,000	3,875,000	1,012
Pennsylvania	4,000	5,369,000	2,625,000	34,000	2,949,000	10,977,000	2,744
Ohio*	5,000	4,500,000	2,025,000	—	874,900	7,400,000	1,480
Mississippi	5,200	5,548,000	2,432,000	200,000	4,032,000	12,212,000	2,348
North Dakota	5,733	5,880,500	400,000	150,000	319,500	6,750,000	1,177
Pennsylvania	5,750	4,277,306	1,895,337	96,652	305,661	6,501,037	1,131
New York	5,800	4,538,000	2,287,100	—	791,800	7,616,900	1,360
Texas	8,000	6,018,400	894,200	5,400	517,900	7,435,900	929
Pennsylvania*	10,600	6,016,940	2,436,522	42,321	429,263	8,925,046	842
New York	11,600	4,436,000	1,117,000	—	1,678,123	7,231,123	623
Colorado	12,000	6,131,000	3,314,000	233,000	1,212,767	10,890,767	908
Michigan	12,000	9,508,000	6,827,000	40,000	3,528,320	19,903,320	1,659
Pennsylvania	19,000	17,340,829	5,458,861	240,161	969,050	24,008,901	1,264
New York	21,000	12,751,000	5,211,000	310,000	2,046,000	20,318,000	968
Pennsylvania	38,000	26,016,000	7,724,000	446,000	3,493,000	37,679,000	992
New York	38,000	29,555,419	7,872,479	240,161	1,555,043	39,223,102	1,032
* Addition. § Replacement.							
OFFSHORE							
Texas	3,300	4,002,000	565,000	—	1,551,960	6,118,960	1,854

Source: FERC Construction Permit Applications, 6/1/82-6/1/83. † Includes engr., supv., inspection, surveying, interest, adm. & overhead, contingencies, and FERC fees.

Average pipeline construction costs



Source: FERC construction permit applications, 6/1/82-6/1/83

The average cost per mile for the projects shows no clear cut trend related either to length or geographic area. In general, the cost per miles within a given diameter indicates that the longer the pipeline, the lower the cost per mile for construction. Still, road, highway, and river crossings and marsh or rocky terrain each have a strong effect on pipeline construction cost.

The cost of compressor stations is another major cost element of natural gas pipelines. Table 5 lists 26 onshore compressor station projects and one offshore compressor station project whose construction permit applications were filed with FERC between June 1, 1982, and June 1, 1983.

For new compressor stations, the cost ranges from a low of \$623/hp for an 11,600 hp station in New York to a high of \$2,348/hp for 5,200 hp station in Mississippi. The cost per horsepower shows no particular correlation with compressor station size or location. Only one offshore compressor construction permit application was filed with FERC for the period covered. It is a 3,300 hp station with an average cost of \$1,854/hp.

Disposition of VLCC Fleet October 1983.

	No of Mil- ves- sels	lions of dwt
Total fleet	578	159.8
Less: US Domestic and		
Preference trades	(16)	(4.1)
Ore Trade	(17)	(4.2)
Long term storage	(35)	(9.7)
VLCCs available for inter- national trade	510	141.8
Less: Vessels in lay- up or casualties	(175)	(50.6)
Active in international ser- vice	335	91.2

reduced the lay-up of VLCCs to around 50 million dwt with the remaining 90 million dwt in active service.

He assumed that a quarter of the active fleet was taken up by slow steaming and longer waiting times, making the total capacity surplus around 75 million dwt.

Goldstein said to access more accurately the future dimensions of the VLCC surplus and the possible timing of a new equilibrium, there should be a continuation and even an acceleration in the rate of scrapping and a stabilization and recovery of the long-haul crude trade.

He noted a marked increase in VLCC sales to breakers from 39 units in 1981 to 57 in 1982. Last year the numbers were about the same as in 1982 but the capacity lost was much greater since the average size of vessel was larger.

But he added that despite the accelerating decline in VLCC capacity since 1979, the contraction of demand has been more pronounced and the absolute surplus of tonnage has reached new peaks.

Reestablishment of a market balance required a consistently high level of demolition sales. Breaking capacity was not a limiting factor as the growth of South Korea as a shipping breaking nation had removed fears of a bottleneck.

Goldstein said despite the falling number of VLCCs the rate of scrapping can be maintained for several years as almost the whole of the fleet will by then have passed its tenth birthday, apparently the threshold for discards.

A survey of vessels delivered between 1969 and 1973, almost half the entire construction of large tankers, showed that 46% had already been deleted from the fleet.

If the same rates were applied to the remaining fleet, much of which was built between 1973 and 1976, scrapping would account for 76 vessels in 1984,

VLCC Attrition, 1969-73 deliveries.

	New buildings	Scrapped	Lost Converted	Remaining	Deleted
1969	45	36	2	7	84%
1970	70	54	3	13	81%
1971	72	32	2	38	47%
1972	82	22	3	57	30%
1973	100	14	2	84	16%
Total	369	158	12	199	46%

86 in 1985, and a peak of 90 tankers in 1986, dropping sharply after this date.

Because of the number and average size of the tankers built in the mid 1970s, the tonnage removed rises from 15 million dwt in 1983 to 19 million dwt in 1984 and a peak of almost 24 million dwt in 1986.

If these figures were achieved the current surplus of tonnage could be eliminated by 1987.

But, said Goldstein, the likelihood of this happening is remote. Even a slight rise in demand and a modest improvement in freight rates as seen in the past few months, can alter the psychology of owners.

He said this was predictable as decisions to scrap were painful and irrevocable.

But as the fleet reduced and there were periodic increases in demand, these episodes will occur more frequently delaying and then stretching out the adjustment process.

Goldstein also contends that a substantial number of laid up VLCCs will not be able to recommence trading except under highly unlikely circumstances.

In 1978 and 1979 tankers were able to leave lay-up with relative ease. But now a large number of the idle vessels have been out of service for over a year.

Of the 175 tankers idle in October last year, 100 had been without work for at least 12 months and many were approaching two years of idleness. At that point, with little or no upkeep a significant degree of vessel deterioration could be expected.

The majority of vessels laid up during the last year were owned or long term chartered to major oil companies and frequently the vessels were in locations not normally associated with rapid activation.

Goldstein said the major oil companies carried an important part of the economic burden resulting from overcapacity. Through scrapping, sales to the second hand market, and redelivery of chartered tonnage the seven majors had reduced their VLCC fleets from more than 300 vessels in 1975 to less than 165 ships, of which 50 are idle.

Radical changes in the sources of

crude curtailed the need for VLCCs on the part of some companies. SP which controlled over 50 VLCCs in the mid 1970s was on its way to disposing of virtually all its owned fleet.

Other majors with continuing long terms commitments to long-haul crude from the Middle East had seen the volume of liftings drop and the requirement for tankers decline.

These companies allowed their chartered fleets to reduce and scrapped the oldest and least efficient of their owned tonnage but would probably keep the major part of the remaining tonnage even with ships idle on a long term basis.

There were also nearly 100 charter-free independent VLCCs in lay-up, of which 69 had been idle for more than a year. A typical VLCC idle for about 18 months in northern Europe would require about \$2 million to reach a loading port in the Middle East assuming no significant steel renewals or unusual mechanical problems.

Goldstein added: It is one thing to buy a vessel at or near its value as scrap; it is another to add fresh speculative capital based on the hope of a short term improvement.

The increasing age of the fleet and the high cost of bringing ships idled for long periods back into operation both indicate that the laid up fleet will not be as responsive to freight market changes as in the past. Recent experience following the improvement in VLCC freights tends to support this assessment," he added.

One sector of the oil industry that has proved to be an increasing market for tanker owners has been the North Sea. Tankers have been converted to run on dedicated routes between offshore field loading buoys and refineries around Europe.

North Sea producers have also been exporting large volumes of crude. But Drewry Shipping Consultants of London says demand will peak in 1984 and fall about 30% by the end of the decade.

In 1984 Drewry expects demand to be 3.5 million deadweight ton years. But a report by the consultants says that on the assumption the relationship between crude production, exports and tanker employment holds firm, then de-

Tanker layups

Duration	Oil* Companies	Independents	Govt. owned	Total
Less than 12 months	42	28	5	75
12-23 months	27	42	0	69
24 months and over	4	27	0	31
Total	73	97	5	175

*Includes time chartered vessels.

mand for tankers will fall to 3 million dwt year in 1985 and fall further to 2.2 million dwt years in 1990.

Any assessment of North Sea tanker demand is governed by the overall level of exports. In 1982, 64% of all production was exported.

Another factor is the extent to which existing and future North Sea developments employ offshore tanker loading of crude in preference to pipelining the oil to a terminal ashore.

As the pipeline network in the North Sea has been extended, it is becoming easier for the new generation of smaller fields to hook into a link to the shore.

Amoco UK Exploration, which has been using tanker loading for its small Montrose field since the late 1970s is laying a short pipeline link so that it can take advantage of spare capacity in British Petroleum's Forties field pipeline to the Scottish mainland.

In the Norwegian sector of the North Sea, Statoil which had originally planned tanker loading for its Gullfaks field has now decided to pump the oil ashore through a pipeline which will serve both Gullfaks and the Norsk Hydro Oseberg development.

This line will land the first crude oil on the Norwegian mainland and will involve a crossing of the deep trench that runs parallel to the coastline.

Statoil's experience during the summer of 1983 with laying the Statfjord gas pipeline across the trench has shown this section of deepwater is no longer a barrier to pipeline connections to the Norwegian mainland.

Statoil is also becoming concerned with the lack of flexibility experienced by tanker loading on the giant Statfjord field. By the time the third platform is operational at the end of 1985, the oil company will have access to almost 600,000 b/d of crude, all loaded through specially converted dedicated tankers.

The dedicated tankers can only deliver crude to north west Europe. Statoil, which handles the bulk of the crude, finds this inhibits sales to customers outside the North Sea countries.

Currently oil has to be transhipped from the dedicated Statfjord tankers to larger vessels trading with North America and southern Europe.

Statoil is planning a major storage and export terminal on a site close to its Mongstad refinery north of Bergen.

Crude oil from the Gullfaks-Oseberg pipeline will be pumped into the terminal and the state company wants additional facilities so that crude from Statfjord can also be stored and re-exported from the facility.

Tanker owners are continually looking for new ways to utilize their laid up vessels. Intertanko and the International Maritime Organization (IMO) have both been promoting the idea of using tankers to carry freshwater to arid oil exporting countries.

A break-through for this idea came at the end of 1982 when Intertanko establish contacts with the six Arabian Gulf state members of the Gulf Cooperation Council, Saudi Arabia, Kuwait, Qatar, Bahrain, Oman and the United Arab Emirates, who are now looking into the feasibility of importing water in incoming tankers.

Intertanko says freshwater consumption is increasing by some 20-30% per annum in some arid oil-exporting countries, caused by increased industrialisation, an improved standard of living, growth in population as well as a determined policy to become self-sufficient in food production.

About 20% of the water produced in oil exporting countries is used for municipal purposes, 77% for irrigation, 2.5% for industry and 0.5% for landscaping and recreation.

At Intertanko's initiative experiments were started in 1978 at Norway's Agricultural University on the use of oil contaminated water for irrigation of vegetables.

A high content of light and heavy crudes -- up to 2% of the water volume -- were used in the experiments.

Intertanko said that importing freshwater by tankers as a substitute for sea water ballast and backhaul cargoes can make an important contribution toward achieving a better balance between demand and the supply of water.

The IMO is now supporting the idea and has initiated studies on the provision of dual purpose reception facilities where freshwater ballast will be treated and used ashore for industrial and agricultural purposes.

Backhauling of freshwater has also been boosted by the implementation of the Marpol 73/78 Convention from October 2 1983 which introduced crude oil washing of cargo tanks after discharg-

ing in oil importing ports, making the cargo tanks on the ballast leg much cleaner for the transport of freshwater.

The normal amount of oil remaining in tanks after unloading is 0.5% - 0.7%. With crude oil washing this figure is reduced to 0.1%-0.2% which means that the oil content of water in ballast tanks should be less than 15 parts per million.

Under the convention, owners also have the option to operate with clean ballast tanks. Some 20% of the oil carrying capacity is lost but it has the advantage of enabling the tanker owner to discharge pollution free ballast water in the oil loading port.

In future new tankers will be constructed with segregated ballast tanks, but says Intertanko, it may be the turn of the century before all the old crude oil carriers are substituted by the new generation of ships.

The Mediterranean, Red Sea and the Arabian Gulf have been declared specially protected areas under IMO Conventions. Oil must be carried in closed systems and deballasting systems provided at oil exporting terminals in these areas.

Intertanko says that when provided these facilities may automatically be dual purposed so cleansed freshwater ballast can be used ashore.

The ballast receiving station will eliminate the discharge of oil contaminated ballast water from tankers. But, adds Intertanko, the provision of these facilities has, unfortunately, been slow.

Freshwater backhauling is most feasible if the freshwater is loaded in the oil discharging port and discharged in the oil loading port. The introduction of freshwater ballast schemes will, therefore, give added incentives to install adequate reception facilities for oil contaminated ballast water in accordance with international regulations.

Tanker freshwater backhauling schemes, where the full cargo carrying capacity is being utilised, has basically been conceived with separate large capacity reception facilities, storage tanks and a distribution network and need not necessarily be located at the oil loading terminals.

During an interim period converted tankers may serve as reception and water treatment plants. Tankers designed for the treatment of oil contaminated ballast have already operated in Greece, Singapore, Sweden, the Soviet Union and the Arabian Gulf.

Supplies of good quality freshwater are available and the export ports should be strategically located along the main tanker routes. Some oil importing terminals have freshwater available but it might be necessary to make small diversions. About 30 potential water ports around the world have been identified.

Tanker and combined carrier conversions: 1982

Type of conversion	Vessel name	Flag	Date of Build	DWT	Vessel name after conversion	Flag after conversion	Age at time of conversion	Vessel type after conversion	Remarks
A	Atsuta Maru O.O	Ja	1973	214,019	Atsuta Maru	Ja	9	Ore Carrier	
A	Caspian Trader O.O	Li	1969	75,669	Caspian Trader	Li	13	Bulk	
A	Catharina O.O	Pa	1967	94,988	Metal Transporter	Ko	15	Dry Cargo	
A	Donau Ore O.O	Li	1971	215,500	Donau Ore	Li	11	Ore Carrier	
A	Kasuga Maru	Ja	1967	76,627	Kibitsu Maru	Ja	15	Coal Carrier	
A	Merrimack	Am	1944	16,000	Merrimack	Am	38	Bulk Carrier	
A	Hitsukawa Maru O.O	Ja	1972	155,129			10	Ore Carrier	
A	Saar Ore O.O	Li	1968	106,400	Saar Ore	Li	14	Ore	
A	Shinwa O.O	Br	1967	87,311	Shinwa	Br	15	Ore	
A	Tantalus O.O	Br	1972	214,592	Tantalus	Br	10	Ore	
A	Vergo B.O	Gr	1972	112,015	Vergo	Gr	10	Ore	
A	West Wonori O.O	Pa	1974	134,022	West Wonori	Pa	8	Ore	
C	Lynda	Li	1973	71,618	Mawashi	Si	9	Livestock Carrier	
					Al-Gasseem				
F	Afran Zenith	Li	1972	95,189			10	Storage	
F	Korea Donghae	Ko	1970	216,187			12	Storage Barge	
F	Medora	Br	1968	207,332	Medora Barge	Br	14	Offshore Tank	
F	Ocean Park	Ko	1974	317,986	Afran Ocean		8	Offshore Storage	
F	Ore Oil Carrier (1)			94,500				Storage	
F	Phillips Enterprise	Li	1973	229,240			9	Tank Storage Barge	
G	World Saga	Li	1972	228,468			10	Drill Base	
I	Kolibris	No	1975	133,754	Ferncarrier	No	7	Semi-Submersible Heavy Lift	
I	Venture Espana	Li	1972	115,851	Sibig Venture	No	10	Semi-Submersible Heavy Lift	
N	Banglar Noor O.O	Ba	1967	93,026	Banglar Noor	Ba	15	Cement Storage	
N	Skyros O.O	Gr	1967	98,543	Muscat Cement	Li	15	Cement Storage	
X	Guadalupe	Me	1958	19,934			(2)	(3)	
X	Victoria								
X	Juan Alvarez	Me	1955	19,100			(2)	(3)	
X	Kaunas	Ru	1956	11,771			(2)	(3)	
X	Lujan de Cuyo	Ar	1962	45,120			(2)	(3)	

Tanker and combined carrier conversions: 1983

A	Lafumina B.O	Li	1968	89,529	Bristol Lake		15	Bulk Carrier	
F	Eiko Maru	Ja	1971	228,136			12	Offshore storage	
F	Herminone	Fr	1971	222,139			12	Offshore storage	
H	Giewont II	Ph	1975	134,992			8	Offshore Oil Transfer	
H	Phillips Arkansas	Li	1980	53,178			3	Converted for North Sea Loading	
H	Phillips Oklahoma	Li	1979	50,000			4	Converted for North Sea Loading	
H	VLCC (1)							Oilfield evacuation ship	
L	Tanker (1)			80,000				DWT to be reduced to 66,000	
N	Cedros OBO	Li	1366	171,000			17	Coal Storage	
O	Worth	Am	1976	91,800			7	Hospital Ship	
O	Rose City	Am	1976	91,800			7	Hospital Ship	

(1) Vessel name unknown. (2) Exact conversion date unknown. (3) Converted vessel type unknown.

Source: Drewry Shipping Consultants Ltd. London

A Dry bulk Cargoes of which Tankers (1). B Specialised Tankers. C Livestock Carriers D Roll On Roll Off. E Containerships. F Offshore Production Platforms and Storage. G Drill Ships. H Other Offshore Support. I Heavy Lift Vessels. J Electric Power Generators. K Slope Reception. L Dejurnboization. M Refineries Factory Ships. N Dry Bulk Storage. O Other. X Unknown.

Intertanko says while the total economy of freshwater imports schemes depends on a number of factors, the transportation costs for backhauling are directly related to the crude oil tanker market.

The operator must evaluate water

transportation from a cost revenue angle. The depressed tanker market hardly covers costs so almost any economic contribution that exceeds the incremental costs concerned with a deviation to pick up water is of interest.

Four freshwater trade routes have

been evaluated for 250,00 dwt and 350,00 dwt tankers - Rotterdam -Arabian Gulf (around the Cape); Cape Fines-terre-Arabian Gulf (around Cape); Dominica-Arabian Gulf and Yakushima-Arabian Gulf. A range of tanker market conditions from Worldscale 30-60 were

used.

Shipping consultants, Drewry Shipping Consultants, said in a report that in addition to using tankers for backhauling freshwater, owners are looking at a number of other schemes to provide alternative employment for tankers.

Schemes range from conversion to drilling units, to conversion as floating electricity generating stations.

Drewry adds that faced with the dramatic drop in new buildings, many shipbuilders have developed a keen interest in conversions. A number of yards specialise in one or two particular types of conversion. They can be technically complex and individual yards have acquired a high level of expertise in specific areas, said the report.

The two forays by the Saudi Arabians into the tanker market to acquire strategic storage gave a boost to the use of inventory tankers just as this sector was beginning to slump.

In its survey of unconventional uses of tankers, Drewry says inventory work is very different from other uses since very little structural alteration is necessary on the tanker and it can be returned to normal transportation duties very quickly.

The use of tankers for storage reached a peak at the end of 1981 and in 1982 and fell away as the crude oil surplus gripped the world.

The Drewry report says floating storage has considerable advantages over land-based storage and is much more economic.

There have been a number of conversions of small and medium sized tankers into dry bulk carriers. One type of conversion involves replacing the forepart of the tankers with a new purpose built section containing the dry bulk holds. This can involve moving the whole bridge structure aft.

In the category of less major conversions are moving a vessel from oil to grain transport through cleaning and possibly recoating the tanks. But there are legal prohibitions in some countries and owners would find it difficult to switch vessels between the oil and grain trades as market conditions varied.

The report adds that a more substantial conversion involves the removal of the pipework on the upper deck and cutting an opening in the cargo area. The tanker cargo tanks would require substantial modification into cargo holds before hatch covers and any other loading or discharge equipment could be installed.

Conversion to an ore oil carrier can be simple as only the center tanks need be modified and strengthened before fitting hatch covers. Drewry says apart from conversions into combis, dry bulk and ore carriers, a few tankers have been converted for the cement trade.

Several tankers have also been con-

Tanker Storage.

	Million dwt	Storage*
1981		
First quarter	10.0	8.1
Second quarter	10.8	8.2
Third quarter	15.2	9.7
Fourth quarter	19.3	11.8
1982		
First quarter	15.4	8.7
Second quarter	14.4	8.0
Third quarter	14.4	8.2
Fourth quarter	10.6	6.6
1983		
First quarter	10.7	5.6
Second quarter	11.0	6.3

* as a percentage of tanker surplus

Source: Drewry's Shipping Statistics and Economics and Tanker Quarterly.

verted into product, chemical and gas carriers. In 1981 Newport News Shipbuilding converted a 34,000 dwt crude carrier into a products chemicals carrier. Other tankers have been turned into bitumen and vegetable oil carriers.

A Singapore shipyard converted the 123,000 dwt crude tanker Esso Orient into a multi-products LPG carrier. In addition to removing superfluous pipework and fittings, a new bulkhead was installed to create additional clean products tanks. The slop tanks were modified to increase the number of cargo tanks and four LPG tanks with associated fitting were installed.

The Esso Orient operates in the Far East, says Drewry, and a conversion aimed at trading in the US Gulf or US Atlantic ports would require a smaller tanker with a shallower draft.

Drewry estimates the cost of converting a 60,000 dwt crude carrier into a products/LPG carrier similar to the Esso Orient would be \$4-\$5million.

A larger crude carrier of 120,000 dwt that might be appropriate for the long haul export trades likely to develop between the Red Sea, the Arabian Gulf and Europe and Japan. The only problems, says Drewry, would be the limited discharge facilities for a vessel of this size. The cost of conversion would be \$6-\$7million.

The report says the outlook for products carriers is optimistic. Modest growth up to 1985 will accelerate demand between 1985 and 1990. The new export refineries of the Middle East will contribute to the growth of the larger vessels.

Even allowing for vessels now on order, the supply of new product carriers will be inadequate to meet demand and substantial new buildings, or conver-

sions will be required both before 1985 and particularly during the latter part of the decade.

And when export-oriented chemical installations in the Middle East, Australasia and Canada come on stream in the mid to late 1980s the existing carrier fleet and the vessels on order will not be able to meet demand.

Tankers have also made a major contribution to the worldwide fleet of livestock carriers which move millions of sheep annually between Australia and the Arabian Gulf.

Twelve vessels of 500,000 dwt have been converted into livestock carriers, about a third of the world fleet. Drewry says the largest sheep carrier is currently the Al Shwaikh, formerly the 80,000 Dwt Erwiken. The vessel was shortened by 60 meters when sheep pens capable of carrying 125,600 sheep, were installed.

Smaller tankers have been converted into roll-on/roll-off car ferries and there is scope for conversion to container vessels although this would require substantial and costly modification.

Drewry adds that in addition to converting tankers into permanent storage as part of offshore production systems, vessels have been turned into drill ships. A number have also been converted into other ancillary vessels to serve the offshore oil industry including pipelaying ships, floating workshops, fire fighting vessels, diving support ships and heavy lift vessels.

Tankers can also become floating power stations. The Norwegian Shipowners Association said a 60,000 dwt tanker could be converted to a 11.1 megawatt generator and a 230,000 dwt vessel could become a 21.8 megawatt unit.

The Drewry report also looks at de-jumboization which involves shrinking the size of a vessel, usually by removing a portion of the mid-section. A number of vessels have been shorted like this.

Recently Chevron announced that it is de-jumboizing some of the company's VLCCs reducing their size by 30% to 150,000 dwt. The cost is \$3 million per vessel.

Drewry says this type of conversion allows vessels to operate fully laden, reducing fuel costs per tonne. Unless the vessel is re-engined, it would be uneconomic compared to a standard, purpose-built vessel of the same size.

The other advantage of de-jumboization is that it allows tankers to operate fully laden in shallow draft ports. This is especially true, says Drewry, if the conversion leaves the vessel with a relatively wide beam and a consequently smaller draft.

Drewry adds that it would be possible to convert tankers into other floating industrial plants including offshore refineries and desalination plants.

Single point mooring around the world

Country	Year	Port Field	Owner	Designer Contractor	Max. Vessel Size (Dwt)	Hose number-Size System	Water Depth (Ft.)
Angola	1968	Cabinda	Gulf	SBM	100,000	2-16"/CALM	77
	1979	Quintuquena	Petrangol	EMH	150,000	2-16"	NA
	1980	Essungo	Texaco/Petrangol	IMODCO	250,000	2-24" & 1-16"/CALM	115
	1980	Cabinda	Gulf	SBM	55,000	1-4"/CALM	118
	1982	Takula	Gulf	SBM	300,000	1-12"/CALM	200
Argentina	1970	Puerto Rosales	YPF	IMODCO	40,000	1-16" & 1-12"/CALM	59
	1975	Caleta Olivia	YPF	IMODCO	60,000	1-20" & 1-12"/CALM	113
	1979	Caleta Cordova	YPF	IMODOC	60,000	1-20" & 1-12"/CALM	89
	1980	Puerto Rosales	YPF	IMODCO	60,000	1-20" & 1-12"/CALM	NA
Australia	1970	Botany Bay	Maritime Services	SBM	120,000	3-12"/CALM	63
Bangladesh	1967	Chittagong	Chittagong Port Trust	IMODCO	45,000	1-12"/CALM	45
Brazil	1968	Tramandai	Petrobras	SBM	105,000	2-16"/CALM	71
	1970	Tramandai	Petrobras	SBM	200,000	1-24"/CALM	71
	1975	Garoupa	Petrobras	CB & I	53,000	NA	NA
	1975	Garoupa	Petrobras	CB & I	53,000	NA	NA
	1976	Sao Francisco	Petrobras	IMODCO	200,000	2-20"/CALM	72
	1978	Garoupa	Petrobras	IMODCO	53,000	2-16"/CALM	410
	1978	Enchova 4	Petrobras	SBM	53,000	1-8"/CALM	410
	1979	Tedut & Tefran	CEC/Petrobras	SBM	200,000	2-20"/CALM	72
	1980	Arembepe	Tibras	SBM	4,000	1-16"/CALM	60
	1981	Pampo	Petrobras	SBM	53,000	1-16"/CALM	460
	1981	RJS 28A	Petrobras	SBM	53,000	1-16"/CALM	395
	1981	Badejo	Petrobras	IMODCO	53,000	2-10"/CALM	338
	1982	Corvina	Petrobras	SBM	53,000	2-8"/CALM	492
Brunei	1971	Seria	Shell	SBM	150,000	2-16"/CALM	73
	1975	Seria	Shell	SBM	210,000	2-20"/CALM	67
	1981	Seria	Shell	Mitsubishi	313,000	1-20" & 1-16"/CALM	NA
Cameroon	1976	Kole	Elf Serepca	IMODCO	150,000	1-12"/CALM	80
	1979	Kole	Elf Serepca	Bluewater	250,000	1-24"/CALM	102
	1979	Limboth Point	Sonara	SBM	150,000	2-16" & 1-16"/CALM	75
	1981	Kole	Elf Serepca	IMODCO	250,000	2-24" & 1-16"/CALM	85
Canada	1969	St. John, N.B.	Irving Oil	SBM	350,000	1-24" & 1-16"/CALM	149
Chile	1971	Quintero Bay	Enap	SBM	209,000	2-20"/CALM	154
Congo	1972	Djeno	Elf Congo	SBM	250,000	2-20"/CALM	75
Denmark	1971	Dan	Danbor	SBM	70,000	1-12"/CALM	150
	1979	Gorm	Danbor	SBM	70,000	2-12"/CALM	128
	1982	NA	DDCS	SOPEC	35,000	2-20"/CALM	50
Dominican Republic	1971	Santo Domingo	Refineria Dominica	SBM	150,000	2-16"/CALM	85
Ecuador	1971	Esmeraldas	Gulf/Texaco	SBM	100,000	2-20"/CALM	124
	1971	Esmeraldas	Gulf/Texaco	SBM	100,000	1-24" & 1-20"/CALM	124
	1978	Esmeraldas	Texaco	IMODCO	100,000	1-24" & 1-20"/CALM	118
Equatorial	1963	Bata	CEPSA	IMODCO	20,000	1-16"/CALM	39
Egypt	1968	Ras-el-Shaiq	Wepco	SBM	100,000	2-16"/CALM	78
	1974	Suez	Sumed	SBM	120,000	2-20"/CALM	82
	1974	Alexandria	Sumed	SBM	120,000	2-20" & 1-16"/CALM	85
	1974	Alexandria	Sumed	SBM	120,000	2-20" & 1-16"/CALM	82
	1974	Alexandria	Sumed	SBM	120,000	2-20" & 1-16"/CALM	82
	1976	Suez	Sumed	IMODCO	250,000	2-24"/CALM	80
	1976	Alexandria	Sumed	IMODCO	250,000	2-24" & 1-20"/CALM	108
	1976	Alexandria	Sumed	IMODCO	250,000	2-24" & 1-20"/CALM	106
	1976	Agami	EGPA	SBM	100,000	2-16"/CALM	98
	1978	El Alamein	Wepco	SBM	100,000	2-16"/CALM	70
	1980	Ras Budran	Suez Oil Co.	SBM	250,000	1-24" & 1-20"/CALM	115

TANKERS

Country	Year	Port Field	Owner	Designer Contractor	Max Vessel Size (Dwt)	Hose number-Size System	Water Depth (Ft.)
	1981	Suez	Sumed	SBM	500,000	2-24" & 1-16" CALM	118
	1982	Sidi Kerir	Sumed	IMODCO	250,000	2-20" & 1-20" CALM	108
	1983	Zeit Bay	SUCO	SBM	155,000	2-20" CALM	82
France	1968	Bay of Biscay	Elf	CFEM	NA	NA	NA
	1973	Frontignan	Mobil	IMODCO	270,000	2-20" CALM	102
Gabon	1965	Gamba	Shell	SBM	100,000	1-16" CALM	63
	1967	Lucina	Shell	SBM	165,000	1-16" CALM	112
	1979	Gamba	Shell	SBM	140,000	1-16" & 1-10" CALM	63
	1983	Inguessi	AMOCO	Bluewater	—	—	—
	1980	Mayumba	Elf Gabon	Bluewater	70,000	1-4" CALM	79
Ghana	1978	Bonsu	Agripetco	SOPEC	64,000	1-10" CALM	79
India	1975	Bombay High	ONGC	SBM	100,000	1-16" & 1-8" CALM	240
	1975	Bombay High	ONGC	SBM	100,000	1-16" CALM	240
	1977	Gulf of Kutch	IOC	SBM	300,000	2-24" CALM	115
	1982	Bombay High	ONGC	IMODCO	2,500	SBBM	262
	1983	Bombay High	ONGC	IMODCO	150,000	1-16" CALM	NA
Indonesia	1970	Pang Kalan Susu	Pertamina	IMODCO	100,000	2-12" CALM	NA
	1971	Balikpapan	Union Oil	SBM	250,000	2-20" & 1-16" CALM	102
	1971	Java Sea	ARCO	McDermott	45,000	1-8"	NA
	1971	Java Sea	IIAPCO	IMODCO	55,000	2-12" CALM	120
	1972	Java Sea	ARCO	IMODCO	133,000	1-12" & 2-16" CALM	135
	1972	Java Sea	IIAPCO	IMODCO	133,000	2-12" & 2-20" CALM	130
	1973	Djatibarang	Pertamina	IMODCO	150,000	3-20" CALM	75
	1973	Ardjuna	ARCO	SBM	150,000	3-16" CALM	138
	1973	Ardjuna	ARCO	SBM	200,000	2-16" CALM	126
	1974	Bekapai	Total	SBM	100,000	2-8" CALM	123
	1974	Ardjuna	ARCO	SBM	NA	SBS	140
	1975	Poleng	Cities Service	SBM	55,000	2-8" SBS	180
	1976	Handil	Total	SBM	125,000	2-20" CALM	105
	1977	Balongan	Pertamina	SBM	150,000	2-20" & 1-16" CALM	74
	1978	Udang	Conoco	SBM	93,000	2-8" SBS	302
	1980	Cinta	IIAPCO	IMODCO	133,000	2-12" & 2-20" CALM	130
	1980	Samarang	Pertamina	SBM	17,000	1-16" CALM	39
	1981	Krisna	IIAPCO	IMODCO	230,000	2-20", 2-16" & 1-6" CALM	NA
	1981	Ardjuna	ARCO	SBM	56,000	1-6" CALM	135
	1981	NA	LETJES	SOPEC	10,000	2-8"	60
	1983	Lalang	BP	Bluewater	140,000	Yoke Tower	NA
	1983	Balongan	Pertamina	SBM	35,000	1-16" CALM	46
Iran	1970	Cyrus	ipac	SBM	140,000	2-16" CALM	141
	1971	Iman Hasan	SIRIP	IMODCO	250,000	2-16" CALM	82
Iraq	1981	Arabian Gulf	Brown & Root	IMODCO	270,000	2-24"	NA
	1981	Arabian Gulf	Brown & Root	IMODCO	270,000	2-24"	NA
	1981	Arabian Gulf	Brown & Root	SBM	270,000	2-24"	NA
	1981	Arabian Gulf	Brown & Root	SBM	270,000	2-24"	NA
Italy	1963	Fimicino	PURFINA	IMODCO	50,000	2-12" CALM	49
	1963	Ravenna	SAROM	IMODCO	50,000	2-12" CALM	NA
	1964	Fiumicino	PURFINA	Dalmine	100,000	1-16" RMD	NA
	1970	Porto Torres	Sardoil	SBM	255,000	2-20" CALM	101
	1972	Ancona	API	Lavore Adriatica Maritime	300,000	NA	NA
	1972	Genoa	Port Authority	CIDONIO	500,000	2-20" & 2-12"	NA
	1978	Nilde	Agip	SBM	80,000	1-6" SALS	312
	1981	Rospo Mare	Elf Italiana	EMH	35,000	2-10"	NA
Ivory Coast	1980	Bouet	Societe Invoirienne de Raffinage	IMODCO	250,000	3-24" CALM	164
	1981	Espoir	Phillips	Bluewater	240,000	1-12" CALM	279
Japan	1961	Niigata	Shell	Niigata	100,000	1-20"	NA
	1963	Oita	Kyushu Oil	IMODCO	100,000	2-12" CALM	177
	1965	Yokkaichi	Showa-Yokkaichi	Mitsubishi	100,000	2-16" & 1-16" CALM	NA
	1965	Yokkaichi	Showa-Yokkaichi	Mitsubishi	100,000	2-16" & 1-16" CALM	NA
	1965	Chiba	Maruzen Oil	IMODCO	100,000	3-12" CALM	NA

TANKERS

Country	Year	Port Field	Owner	Designer Contractor	Max. Vessel Size (Dwt)	Hose number-Size System	Water Depth (Ft.)
	1967	Koshiba	US Army	IMODCO	100,000	2-12" CALM	65
	1968	Hakozaki	US Army	IMODCO	100,000	2-16" & 2-12" CALM	60
	1968	Kawasaki	Showa-Mitsubishi	Mitsubishi	265,000	2-24" CALM	NA
	1968	Hakodate	Asia Oil	IMODCO	32,000	1-16" CALM	49
	1968	Yokkaichi	Daikyo Oil	Mitsubishi	200,000	2-20" CALM	NA
	1968	Yokkaichi	Daikyo Oil	Mitsubishi	230,000	2-20" CALM	NA
	1969	Toyama	Japan Sea Oil	IMODCO	150,000	2-16" CALM	NA
	1969	Yokohama	Ugishima Oil	Mitsubishi	200,000	2-20" CALM	NA
	1969	Ube	Seibu Oil	Mitsubishi	200,000	2-20" CALM	NA
	1970	Atsumi	Chubu Electric	Mitsubishi	200,000	2-20" CALM	NA
	1970	Himeji	Idemitsu Oil	IMODCO	220,000	2-20" CALM	NA
	1970	Buckner Bay	Toyo Gasoline	IMODCO	100,000	2-16" CALM	NA
	1970	Tengan	US Army	IMODCO	50,000	2-12" CALM	70
	1971	Nakagusuki Bay	Esso	Esso, Van Houten	250,000	2-24" SALM	85
	1973	Ube	Seibu Oil	Mitsubishi	200,000	2-20" CALM	NA
	1974	Kawasaki	Showa-Mitsubishi	Mitsubishi	300,000	2-20" CALM	NA
	1975	Yokohama	Ogishima Oil	Mitsubishi	200,000	2-20" CALM	NA
	1976	Yokkaichi	Showa-Yokkaichi	Mitsubishi	300,000	1-20" & 1-20" CALM	NA
	1981	Mutsu-Ogawara	JNOC	SOPEC	350,000	2-24" SALM	145
	1983	Fuqui	JNOC	SOPEC	240,000	2-20" SALM	148
Kuwait	1967	Ras Al Khafji	Arabian Oil	McDermott	150,000	1-16" & 1-12"	NA
	1972	Ras Al Khafji	Arabian Oil	McDermott	250,000	1-24" & 1-10"	NA
	1977	Mina-Al-Ahmadi	KOC	ETPM	532,000	2-24" & 1-16" RMD	NA
Libya	1962	Brega	Esso	Esso	100,000	Fixed Tower/Loading Arm	NA
	1965	Ras-es-Sider	Oasis	SBM	100,000	3-16" CALM	101
	1968	Zueitina	Occidental	SBM	100,000	1-24" CALM	100
	1968	Zueitina	Occidental	SBM	150,000	2-24" CALM	105
	1968	Zueitina	Occidental	SBM	150,000	2-24" CALM	105
	1969	Brega	Esso	Esso, Van Houten	300,000	1-24" SALM	140
	1969	Ras Lanuf	Mobil	SBM	255,000	2-24" CALM	96
	1969	Ras-es-Sider	Oasis	SBM	255,000	2-24" CALM	101
	1974	Azzawiya	NOC	DBV Woodfield	100,000	2-16"	NA
	1974	Azzawiya	NOC	DBV Woodfield	30,000	1-8" & 1-10"	NA
	1976	Azzawiya	NOC	SBM	140,000	2-20" SALM	85
	1976	Azzawiya	NOC	SBM	100,000	2-20" SALM	98
	1979	Zueitina	Occidental	IMODCO	275,000	2-24" CALM	99
	1980	Ras-es-Sider	Oasis	SBM	300,000	2-24" CALM	102
	1983	Ras-es-Sider	Oasis	IMODCO	NA	CALM	NA
Malaysia	1959	Miri	Shell	SBM	70,000	2-8" & 1-6" CALM	48
	1959	Miri	Shell	SBM	70,000	2-12" & 1-16" CALM	48
	1962	Miri	Shell	SBM	70,000	2-8" & 1-6" CALM	48
	1962	Port Dickson	Shell	SBM	100,000	2-16" CALM	90
	1963	Miri	Shell	SBM	70,000	2-12" & 1-6" CALM	53
	1974	Labuan	Shell	SBM	313,000	2-20" CALM	98
	1974	Tembungo	Exxon	SOPEC	94,000	1-10" SALM	300
	1974	Pulai	Exxon	SBM	190,000	1-12" SALM	240
	1977	Pulai	Exxon	SBM	166,000	SALS	216
	1978	Bintulu	Shell	SBM	210,000	2-20" CALM	67
	1981	Trengganu	Petronas	SOPEC	85,000	2-20" SALM	60
	1981	Trengganu	EPMI	SBM	250,000	1-24" SALM	92
	1981	Trengganu	EPMI	SBM	250,000	1-24" SALM	85
Mexico	1973	Tuxpan	Pemex	IMODCO	60,000	2-16" CALM	60
	1974	Tuxpan	Pemex	IMODCO	60,000	1-10" & 3-16" CALM	67
	1976	Salina Cruz	Pemex	IMODCO	60,000	3-16" & 1-12" CALM	75
	1976	Rosarito Beach	Pemex	IMODCO	60,000	1-20" & 2-16" CALM	77
	1978	Rabon Grande	Pemex	IMODCO	150,000	1-16" & 2-20" CALM	90
	1980	Cayo Arcas	Pemex	IMODCO	151,000	2-24" & 1-16" CALM	144
	1980	Doc Bocas	Pemex	SBM	250,000	2-24" & 1-16" CALM	93
	1981	Cayo Arcas	Pemex	SBM	250,000	2-20" & 1-16" CALM	151
	1981	Dos Bocas	Pemex	SBM	250,000	2-24" & 1-16" CALM	93
	1981	Salina Cruz	Pemex	Mitsubishi	250,000	2-24" & 1-16" CALM	NA
	1981	Cayo Arcas	Pemex	EMH	285,000	2-20" RMD	131
	1981	NA	Pemex	SOPEC	2,000	SBBM (21)	150
Morocco	1971	Mohammedia	RAPC	IMODCO	100,000	1-8" 1-20" CALM	72

TANKERS

Country	Year	Port Field	Owner	Designer Contractor	Max. Vessel Size (Dwt)	Hose number-Size System	Water Depth (Ft.)
						1-20" CALM	62
New Caledonia	1977	Noumea	Le Nickel	SBM	100,000	1-12" CALM	64
					75,000	2-12" CALM	77
New Zealand	1971	Waipipi Point	Marcona Corp.	IMODCO	70,000	2-12" CALM	105
	1972	Taharoa	New Zealand Steel	IMODCO	150,000	2-12" CALM	
	1976	Taharoa	New Zealand Steel	SBM			
					2,000	1-3" & 1-4" CALM	13
Nigeria	1967	Lagos	Nidogas	IMODCO	100,000	2-16" CALM	70
	1968	Escravos	Gulf	IMODCO	210,000	1-20" CALM	83
	1968	Forcados	Shell	SBM	210,000	1-24" CALM	83
	1968	Forcados	Shell	SBM	255,000	2-24" CALM	90
	1971	Qua Iboe	Mobil	IMODCO	313,000	1-24" CALM	91
	1971	Forcados	Shell	SBM	313,000	1-24" CALM	91
	1971	Bonny	Shell	SBM	313,000	1-24" CALM	96
	1971	Bonny	Shell	SBM	200,000	2-20" CALM	87
	1971	Bonny	Shell	IMODCO	50,000	2-20" & 1-12" CALM	93
	1972	Brass River	Agip	SBM	250,000	2-20" CALM	95
	1974	North Apoi	Texaco	SBM	250,000	2-20" CALM	94
	1974	North Apoi	Texaco	IMODCO	250,000	2-24" CALM	102
	1976	Brass River	Agip	SBM	300,000	2-24" CALM	95
	1977	North Apoi	Texaco	SBM	300,000	2-24" CALM	
	1977	Escravos	Mobil	IMODCO			
	1979	Qua Iboe	Mobil				
					60,000	1-12" CALM	232
					150,000	1-12" CALM	208
Norway	1970	Ekofisk	Phillips	SBM	125,000	2-20" AC	NA
	1970	Ekofisk	Phillips	CFEM	150,000	1-20" ALP	480
	1976	Statfjord	Mobil	SBM	150,000	1-20" ALP	478
	1979	Statfjord B	Mobil	SBM			
	1982	Statfjord C	Mobil	SBM			
					100,000	2-8" CALM	71
Oman	1963	Mina-al-Fahal	P.D. Oman	SBM	165,000	2-16" & 1-8" CALM	115
	1966	Mina-al-Fahal	P.D. Oman	SBM	165,000	2-20" & 2-8" CALM	124
	1966	Mina-al-Fahal	P.D. Oman	SBM	500,000	2-20" & 2-8" CALM	155
	1973	Mina-al-Fahal	P.D. Oman	SBM	350,000	2-20" & 2-12" CALM	124
	1979	Mina-al-Fahal	P.D. Oman	SBM			
					150,000	2-20" CALM	NA
Panama	1981	Chiriqui Grande	Petroterminal de Panama	EMH	150,000	2-20" CALM	NA
	1981	Chiriqui Grande	Petroterminal de Panama	EMH	150,000	2-20" CALM	NA
	1983	Chiriqui Grande	Petroterminal de Panama	EMH			
					108,000	2-16" & 1-10" CALM	85
Philippines	1967	Subic Bay	US Navy	IMODCO	70,000	1-12" CALM	200
	1978	Nido	Cities Service	SBM	127,000	1-12" CALM	300
	1980	Cadiao	Amoro	SBM	300,000	2-24" CALM	94
	1980	Bataan	Bataan Refining	SOPEC	55,000	2-10" CALM	219
	1982	Nido	Cities Service	Bluewater			
					100,000	2-16" CALM	97
					300,000	2-24" CALM	NA
Qatar	1965	Halul	QGPC	SBM	300,000	1-20" & 1-24" CALM	66
	1972	Halul	QGPC	McDermott	300,000	1-20" & 1-24" CALM	88
	1972	Umm Said	QGPC	IMODCO	65,000	1-6" CALM	120
	1976	Doha	QGPC	SBM	540,000	2-20" & 1-10" CALM	NA
	1979	Halul	QGPC	SBM	500,000	CALM	
	1983	Umm Said	QGPC	IMODCO			
					250,000	2-24" & 1-16" CALM	111
					450,000	2-24" CALM	129
Saudi Arabia	1970	Zuluf	Aramco	SBM	500,000	2-24" & 1-12"	NA
	1970	Zuluf	Aramco	SBM	500,000	2-24" & 1-12"	NA
	1974	Ju'aymah	Aramco	McDermott	500,000	2-24" & 1-12"	NA
	1974	Ju'aymah	Aramco	McDermott	500,000	2-24" & 1-12"	135
	1974	Ju'aymah	Aramco	McDermott	750,000	2-24" & 1-12" CALM	117
	1974	Ju'aymah	Aramco	SOPEC	750,000	2-24" & 1-12" CALM	NA
	1975	Ju'aymah	Aramco	SOPEC	300,000	1-24" & 1-10" CALM	
	1975	Ju'aymah	Aramco	SOPEC			
	1981	Ras Al Khatji	Aramco	Mitsubishi			
					252,000	2-24" CALM	88
					300,000	2-24" CALM	NA
Singapore	1971	Singapore Harbor	Esso	IMODCO	300,000	2-24" CALM	105
	1974	Keppel	Shell	IMODCO			
	1980	Singapore Harbor	PSA	IMODCO			
					210,000	2-20" CALM	150
					210,000	1-20" CALM	150
South Africa	1969	Durban	Shell	SBM			
	1974	Durban	Shell	SBM			
					75,000	2-12" 1-8" & 1-4" CALM	65
South Korea	1963	Ulsan	KOC	IMODCO	100,000	2-16" CALM	112
	1969	Yosu	Honam Oil	IMODCO			

TANKERS

Country	Year	Port/Field	Owner	Designer/ Contractor	Max. Vessel Size (Dwt)	Hose number- Size/System	Water Depth (Ft.)
	1969	Ulsan	KOC	IMODCO	200,000	2-16" & 1-12" CALM	88
	1977	Onsan	KIPCO	IMODCO	250,000	2-24" CALM	90
	1980	Ulsan	KOC	Mitsubishi	325,000	2-24" & 1-16"	NA
Spain	1966	Huelva	Rio Tinto	SBM	100,000	2-16" CALM	75
	1971	Amposta	Shell	SBM	33,530	2-10" CALM	209
	1973	Tarragona	Enpetrol	SBM	325,000	2-24" & 1-12" CALM	135
	1975	Algeciras	Cepsa	DBV Woodfield	500,000	2-20" & 1-12"	NA
	1976	Castellon	Shell	SBM	55,000	SALS	383
	1979	Badalona	Campsa	SOPEC	50,000	2-12" SALM	107
Sweden	1959	Dalarn	Swedish Navy	IMODCO	3,000	1-4" CALM	150
Taiwan	1967	Tai-Chung	US Air Force	IMODCO	50,000	1-12" CALM	76
	1968	Kaohsiung	CPC	IMODCO	100,000	2-16" & 1-10" CALM	68
	1968	Tai-Chung	US Air Force	IMODCO	50,000	1-12" CALM	76
	1971	Kaohsiung	CPC	SBM	250,000	2-20" CALM	100
	1972	Kaohsiung	CPC	SBM	250,000	2020" CALM	115
	1979	Chu-Wei	CPC	IMODCO	250,000	2-20" CALM	121
	1981	Ta-Lin-Po	CPC	SBM	250,000	2-24" & 1-16" CALM	130
Tanzania	1971	Dar-Es-Salaam	Tanzanian Harbour Authorities	SBM	100,000	2-20" CALM	78
Thailand	1979	Gulf of Thailand	Union	Bluewater	70,000	1-8" CALM Yoke	NA
	1981	Erawan	Union	Bluewater	85,000	1-8" CALM	219
Trinidad	1971	Galeota Point	Amoco	SBM	250,000	2-20" CALM	95
	1973	Point-A-Pierre	Texaco	IMODCO	260,000	1-12" & 2-24" CALM	78
	1976	Galeota Point	Amoco	IMODCO	250,000	2-20" CALM	95
Tunisia	1972	Ashtart	Aquitaine	SBM	70,000	SBS	220
	1974	Ashtart	Aquitaine	SBM	100,000	1-20" CALM	220
	1978	Ashtart	Serept	SBM	137,000	1-20" & 1-10" SBS	220
	1982	Tazerka	Shell/Tunirex	SBM	210,000	SALS	470
United Arab Emirates	1968	Fateh	Conoco	SBM	150,000	2-16" CALM	103
	1972	Das Island	BP	IMODCO	300,000	2-24" & 1-16" CALM	94
	1972	Fateh	Dubai Petroleum	McDermott	300,000	2-24"	NA
	1972	Mubarras Island	ADOC	SBM	200,000	1-24" CALM	58
	1973	Mubarek	Crescent	SBM	350,000	2-20" & 1-16" CALM	160
	1974	Abu-Al-Burr- Koosh	Total/ABK	SBM	100,000	2-12" CALM	97
	1977	Das Island	ADMA	IMODCO	400,000	2-24" & 1-16" CALM	94
	1977	Arzanah	Amerada Hess	SBM	252,000	1-12" CALM	107
	1979	Fateh	Dupetco	IMODCO	120,000	2-20" CALM	130
	1980	Zakum	Zadco	IMODCO	350,000	2-20" & 1-20" CALM	95
	1980	Zakum	Zadco	IMODCO	350,000	2-20" & 1-20" CALM	95
	1981	Sharjah	Amoco	SBM	300,000	1-20" CALM	65
	1981	Abu-Al-Koosh	Total	EMH	232,799	1-10"	NA
	1983	Salah	Gulf Ras al Khaimah	IMODCO	300,000	CALM	100
United Kingdom	1965	Nore Estuary	BP	BP/Harlan Wolff	100,000	NA	NA
	1970	Humber River	Conoco	SBM	210,000	1-24" CALM	74
	1972	Auk	Shell/Esso	Shell/ SBM	42,000	1-10" EL SBM	280
	1973	Argyll	Hamilton Bros.	SBM	100,000	1-12" CALM	252
	1974	Montrose	Amoco	SBM	50,000	1-10" CALM	304
	1974	Montrose	Amoco	SBM	50,000	1-10" CALM	304
	1975	Brent	Shell/Esso	Shell/ HC	90,000	NA	NA
	1975	Anglesey	Shell	SBM	750,000	2-24" & 1-16" CALM	127
	1975	Scapa Flow	Occidental	Micoperi	250,000	NA	NA
	1975	Scapa Flow	Occidental	Micoperi	250,000	NA	NA
	1975	Bewryl	Mobil	CFEM	NA	NA	NA
	1975	Thistle	BNOC	SBM	80,000	2-16" SALM	535
	1977	Brent	Shell	SBM	80,000	1-16" CALM	460
	1978	Buchan	BP	IMODCO	107,000	1-12" CALM	369
	1979	Fulmar	Shell	Exxon	210,000	2-16" SALM	270
	1979	Ninian	Chevron	IMODCO	3,500	SBBM	433
	1980	Ninian	Chevron	IMODCO	3,500	SBBM(4)	433
	1982	Maureen	Phillips	EMH	85,000	1-16" AC	NA
	1980	Humber River	Conoco	SBM	280,000	1-24" CALM	74
	1981	Beryl A	Mobil	SBM	85,000	1-20" CALM	395
	1982	Beryl B	Mobil	EMH	80,000	1-16" ALP	NA



Country	Year	Port/Field	Owner	Designer/ Contractor	Max. Vessel Size (Dwt)	Hose number- Size/System	Water Depth (Ft.)
United States	1967	Louisiana	Kerr-McGee	McDermott	8,000	1-4"	NA
	1978	Worldwide (portable)	US Navy	IMODCO	70,000	2-10"/CALM	65-200
	1980	Louisiana	Loop	SOFEC	700,000	2-24"/SALM	110
	1980	Louisiana	Loop	SOFEC	700,000	2-24"/SALM	112
	1980	Louisiana	Loop	SOFEC	700,000	2-24"/SALM	114
	1981	Santa Ynez	Exxon	IMODCO	50,000	1-12", 1-8", 6-1" & 1-6"/SALM	494
Uruguay	1975	Jose Ignacio	Ancap	SBM	150,000	2-24"/CALM	64
Venezuela	1968	Moron	CVP	SBM	100,000	2-16"/CALM	63
West Germany	1962	Cuxhaven	West Germany Navy	IMODCO	2,500	1-4" CALM	26
Western Sahara	1961	El Aaiun	CEPSA	IMODCO	3,000	1-6" CALM	28
Zaire	1975	Zaire	Gulf	IMODCO	100,000	2-16" CALM	71
	1976	Zaire	Gulf	IMODCO	79,200	2016" CALM	79

*Updated from PennWell Maps, 1983

MAJOR COMPANY REPORTS

Capital and exploration expenditures

(U.S. \$ Million)	1975	1976	1977	1978	1979	1980	1981	1982
Capital and Exploration Expenditures								
Amerada Hess	283	291	422	353	659	985	1,261	875
Ashland	216	252	501	317	292	286	296	423
Atlantic Richfield	1,751	1,826	1,681	1,358	1,823	3,370	3,559	3,953
British Petroleum	1,751	2,167	1,765	2,409	2,766	2,416	8,215	6,402
C.F.P. (Total Group)*	826	1,249	899	739	697	1,459	NA	NA
Conoco	844	797	853	1,113	1,586	1,768	NA	1,531
Diamond Shamrock	213	400	439	381	310	500	-590	660
E.N.I.	1,169	1,481	1,346	1,478	1,922	2,510	3,756	3,722
Exxon	3,654	5,100	4,600	5,300	7,400	8,000	11,095	11,412
Getty	513	618	684	865	1,239	1,345	1,975	1,860
Gulf	1,546	1,742	3,013	2,129	2,513	2,968	4,325	3,740
Kerr-McGee	235	333	269	270	389	575	606	674
Marathon	273	1,067	557	590	790	947	1,499	NA
Mobil	1,469	2,485	1,786	2,175	3,812	4,649	4,469	3,821
Murphy	215	175	263	285	317	382	661	616
Occidental†	321	370	390	510	566	1,080	1,342	1,159
Pennzoil	217	247	264	344	369	524	604	606
Petro-Canada	NA	NA	NA	231	368	430	679	1,046
Phillips	679	716	1,078	940	1,454	1,666	2,664	2,132
Shell Group	3,113	4,188	5,227	5,252	9,034	7,959	9,320	9,231
Std. Calif.	2,360	1,705	1,429	1,692	2,258	3,599	5,568	4,666
Std. Indiana	2,114	1,774	1,874	2,240	3,028	4,326	5,211	4,438
Std. Ohio	1,642	1,700	1,087	762	602	1,007	4,501	2,708
Sun	657	616	667	717	852	3,800	1,519	1,800
Tenneco	550	620	714	1,008	1,477	1,825	2,359	2,103
Texaco	1,864	1,583	1,564	1,581	1,642	3,077	3,166	3,768
Union	680	798	813	782	1,088	1,700	1,961	1,917

*Converted to U.S. dollars using exchange rate in effect at fiscal yearend.
Source: Annual reports †Includes Cities Service beginning in 1982.

Gas production

	1975	1976	1977	(MMcfd) 1978	1979	1980	1981	1982
Amerada Hess	653	591	625	591	638	638	625	532
Ashland†	311	313	215	233	153	26	28	27
Atlantic Richfield	1,819	1,748	1,642	1,517	1,486	1,388	1,296	1,272
British Petroleum*	300	350	358	385	332	309	345	423
C.F.P. (Total Group)*	33	51	117	293	470	536	NA	NA
Conoco	1,551	1,606	1,579	1,504	1,472	1,364	NA	931
Diamond Shamrock	NA	NA	NA	283	302	303	308	280
ENI	1,255	1,401	1,268	1,330	1,328	1,376	1,311	1,350
Exxon*	10,645	10,678	10,488	10,368	10,181	9,400	6,727	5,749
Getty	1,118	993	892	797	883	878	900	897
Gulf	2,433	2,035	2,167	2,153	2,176	2,032	1,897	1,636
Kerr-McGee*	244	247	222	230	244	236	229	230
Marathon	385	440	463	425	447	562	596	207
Mobil	3,311	3,146	3,240	3,270	3,649	3,599	2,984	2,639
Murphy	90	92	85	110	146	166	141	132
Occidental§	49	49	48	57	70	82	109	946
Pennzoil	547	501	509	587	622	621	561	489
Petro-Canada	NA	NA	NA	1,035	1,113	900	1,035	1,260
Phillips	1,455	1,380	1,343	1,549	1,558	1,497	1,388	1,025
Shell Group*	6,621	6,714	6,674	6,439	6,516	5,646	5,628	5,192
Std. Calif.	1,800	1,789	1,778	1,712	1,732	1,739	1,674	1,626
Std. Indiana	3,388	3,272	3,286	3,263	3,328	3,057	3,096	2,789
Std. Ohio*	90	79	86	83	81	80	84	91
Sun	1,392	1,330	1,271	1,171	1,200	1,157	1,149	963
Tenneco	1,200	1,149	1,107	1,108	1,157	1,139	1,222	1,080
Texaco	4,035	3,927	3,883	3,894	3,646	3,103	2,931	2,140
Union	1,442	1,391	1,290	1,255	1,266	1,226	1,206	1,179

*Sales †Year ended Sept. 30 §Includes Cities Service beginning in 1982.
Source: Annual reports.

MAJOR COMPANIES

Net production of crude oil and NGL

	1975	1976	1977	(Thousand b/d)		1978	1979	1980	1981	1982
Amerada Hess	156	169	178	177	191	190	156	153		
Ashland	58	65	37	37	25	13	12	17		
Atlantic Richfield	594	511	563	643	568	589	573	643		
British Petroleum*	3,440	3,540	3,390	1,430	1,445	1,381	1,356	1,275		
C.F.P. (Total Group)*	1,454	1,510	1,430	1,437	1,409	1,268	NA	NA		
Conoco	436	461	464	469	482	458	NA	401		
Diamond Shamrock	NA	NA	NA	10	9	10	11	10		
ENI	290	316	309	356	367	333	239	222		
Exxon	4,959	5,325	5,091	4,691	4,444	4,011	3,796	3,099		
Getty	409	398	431	444	425	416	424	423		
Gulf	2,040	1,801	1,687	1,591	1,733	1,178	1,042	973		
Kerr-McGee	35	38	38	35	33	33	29	36		
Marathon	265	290	311	299	304	290	235	86		
Mobil	2,144	2,063	2,278	2,024	2,180	1,984	1,844	1,560		
Murphy	48	46	52	52	52	62	62	65		
Occidental	150	173	254	326	351	296	247	693		
Pennzoil	45	43	42	45	42	37	37	36		
Petro-Canada	NA	NA	NA	188	191	171	195	186		
Phillips	365	384	403	444	436	452	409	385		
Shell Group	4,786	4,732	4,847	4,714	4,555	3,719	3,347	3,791		
Std. Calif.	3,025	3,542	3,403	3,289	3,199	3,009	2,813	1,863		
Std. Indiana	945	932	1,004	1,032	849	836	794	766		
Std. Ohio	50	42	183	535	611	716	717	695		
Sun	363	294	284	275	237	235	245	242		
Tenneco	82	89	93	94	99	95	117	127		
Texaco	3,591	3,860	3,786	3,410	3,475	†3,316	3,188	1,895		
Union	357	349	335	312	265	251	236	240		

*Crude only.
Source: Annual reports.

Refined product sales

(Thousand b/d)	1975	1976	1977	1978	1979	1980	1981	1982
Amerada Hess	523	580	648	642	623	550	515	463
Ashland	441	478	517	509	531	481	420	395
Atlantic Richfield	761	812	829	831	860	788	726	765
British Petroleum	1,760	1,920	1,940	2,380	2,620	2,390	2,190	2,155
C.F.P. (Total Group)	1,131	1,186	1,183	1,259	1,292	1,224	NA	NA
Conoco	594	592	601	642	622	546	NA	532
Diamond Shamrock	NA	NA	NA	68	69	84	84	90
ENI	705	790	751	795	930	892	910	846
Exxon	4,990	5,353	5,266	5,390	5,319	4,936	4,601	4,310
Getty	280	285	306	303	305	351	334	348
Gulf	1,610	1,609	1,669	1,683	1,684	1,346	1,194	1,190
Kerr-McGee	229	217	220	206	171	158	150	157
Marathon	370	441	567	612	624	523	504	441
Mobil	2,211	2,264	2,299	2,374	2,362	2,259	2,138	2,094
Murphy	138	141	138	142	131	109	118	127
Occidental	—	—	—	—	—	—	—	251
Pennzoil	69	67	62	65	66	56	56	55
Petro-Canada	NA	NA	NA	7	43	45	90	102
Phillips	611	577	532	516	508	509	501	513
Shell Group	4,620	4,652	4,691	4,900	4,712	4,301	4,121	4,846
Std. Calif.	2,116	2,339	2,455	2,456	2,479	2,374	2,173	1,821
Std. Indiana	1,166	1,245	1,294	1,371	1,316	1,168	1,014	1,024
Std. Ohio	351	403	407	427	430	414	378	371
Sun	687	728	678	685	678	618	556	587
Tenneco	157	153	154	152	137	126	142	133
Texaco	3,241	3,277	3,227	3,236	3,138	2,824	2,656	2,354
Union	434	453	439	458	463	422	365	364

Source: Annual reports.

MAJOR COMPANIES

Crude runs to stills

(Thousand b/d)	1975	1976	1977	1978	1979	1980	1981	1982
Amerada Hess	519	551	596	585	560	481	414	416
Ashland	331	348	358	353	368	363	322	312
Atlantic Richfield	722	723	775	815	823	727	627	631
British Petroleum	1,720	1,900	1,860	2,000	2,290	1,917	1,638	1,550
C.F.P. (Total Group)	970	1,028	1,010	1,051	1,079	1,224	NA	NA
Conoco	465	464	457	455	494	402	NA	387
Diamond Shamrock	NA	NA	NA	50	50	57	59	66
ENI	624	794	736	785	887	849	894	808
Exxon	4,331	4,359	4,348	4,427	4,354	4,150	3,878	3,482
Getty	256	282	280	281	275	269	266	274
Gulf	1,701	1,697	1,766	1,766	1,753	1,384	1,133	1,027
Kerr-McGee	153	165	165	145	123	113	113	118
Marathon	339	390	537	564	541	471	423	393
Mobil	2,060	2,049	2,075	2,064	2,063	1,978	1,773	1,711
Murphy	91	91	94	106	111	91	100	112
Pennzoil	51	53	56	49	56	53	48	48
Phillips	370	318	297	302	287	262	285	277
Shell Group	4,258	4,191	4,286	4,242	4,221	3,768	3,315	2,971
Std. Calif.	2,105	2,257	2,301	2,205	2,234	2,186	1,988	1,545
Std. Indiana	1,104	1,176	1,212	1,286	1,200	1,042	944	925
Std. Ohio	364	405	423	421	429	401	362	360
Sun	596	605	609	622	608	518	459	438
Tenneco	84	85	91	88	92	91	99	93
Texaco	2,772	2,860	2,870	2,788	2,857	2,533	2,211	1,795
Union	439	425	437	419	429	381	372	364

Source: Annual reports.

Net income, gross operating revenue

(U.S. \$ million)	1977		1978		1979		1980		1981		1982	
	Net income	Gross op. rev.	Net income	Gross op. rev.	Net income	Gross op. rev.	Net income	Gross op. rev.	Net income	Gross op. rev.	Net income	Gross op. rev.
Amerada Hess	182	4,591	139	4,701	507	6,770	540	7,956	212	9,396	169	8,394
Ashland	164	5,051	148	5,426	176	6,740	197	8,520	90	9,507	181	9,274
Atlantic Richfield	702	11,413	804	12,739	1,166	16,677	1,536	24,156	1,671	28,208	1,676	27,455
British Petroleum†	795	33,031	987	38,983	3,598	50,407	3,430	60,579	2,047	59,972	1,153	47,524
C.F.P. (Total Group)†	63	12,901	109	13,595	1,509	17,765	1,223	24,260	NA	NA	NA	NA
Conoco	381	9,052	451	9,872	815	13,083	1,026	18,766	NA	NA	\$669	17,230
Diamond Shamrock	169	1,595	123	1,783	160	2,312	213	3,145	230	3,376	150	3,224
ENI†	(389)	14,518	(439)	16,672	52	22,890	51	27,675	(142)	NA	(1,268)	30,594
Exxon	2,443	58,460	2,763	64,886	4,295	84,809	5,660	110,469	5,568	113,197	4,186	103,559
Getty	321	3,544	330	3,758	604	5,121	872	10,437	857	12,887	692	12,311
Gulf	752	19,595	791	19,892	1,322	23,266	1,307	28,790	1,231	28,252	900	30,630
Kerr-McGee	119	2,165	118	2,072	160	2,683	182	3,478	211	3,826	210	3,777
Marathon	197	4,657	225	4,955	323	7,200	379	8,754	343	9,220	1,238	9,631
Mobil	1,026	34,443	1,131	36,684	2,007	47,485	2,819	63,652	2,433	68,587	1,380	64,137
Murphy	47	1,148	47	1,218	104	1,596	151	2,017	163	2,447	158	2,682
Occidental	154	6,080	7	6,316	562	9,638	711	12,476	722	14,708	156	18,527
Pennzoil	100	1,280	128	1,553	239	2,052	309	2,483	221	2,682	189	2,269
Petro-Canada	NA	NA	27	205	126	766	164	1,035	204	2,716	131	3,378
Phillips	531	6,284	718	6,998	891	9,503	1,070	13,377	879	15,966	646	15,892
Shell Group	3,071	53,438	2,422	53,777	6,804	66,111	5,503	82,610	4,038	88,454	3,488	86,025
Std. Calif.	992	22,238	1,089	24,597	1,785	31,755	2,401	42,900	2,380	45,229	1,377	35,943
Std. Indiana	1,032	14,263	1,076	16,350	1,507	20,197	1,915	27,831	1,922	29,947	1,826	29,783
Std. Ohio	181	3,523	450	5,198	1,186	7,916	1,811	11,023	1,947	13,811	1,879	13,842
Sun	412	6,437	415	7,494	700	10,666	785	13,200	642	15,012	537	16,258
Tenneco	417	7,480	452	8,877	571	11,338	726	13,226	813	15,462	819	15,220
Texaco	890	28,444	853	29,124	1,759	39,096	2,240	52,486	2,310	57,628	1,281	48,019
Texas Eastern	124	2,016	137	2,028	181	2,944	NA	NA	221	4,526	161	5,654
Union	334	6,099	382	6,490	501	8,082	647	10,437	791	11,104	804	10,899
Union Pacific (Champlin)	222	2,554	264	2,989	382	4,029	NA	NA	160	3,981	125	3,784

*Excludes nonrecurring gains and losses when their effect can be determined.

†Converted to U.S. dollars using exchange rate in effect at fiscal yearend.

Source: Annual reports §After tax operating income.

WORLDWIDE GAS PROCESSING

Capacities as of January 1, 1983, and average production

State	No. plants	MMcfd		Production—1,000 gal day (Averaged based on the past 12 months)									Total products
		Gas capacity	Gas through-put	Ethane	Prop.	Isobut.	Normal unsplit butane	LP-gas mix	Raw NGL mix	Debut. nat. gaso.	Other		
Alabama	5	182.0	108.4		147.8		119.9			60.3	324.2	652.2	
Alaska	2	51.5	37.1		5.7				71.7			77.4	
Arkansas	3	132.0	60.1		20.3	4.2	13.9			15.1		53.5	
California	37	1,191.5	490.1		289.8	24.6	45.0	15.4	275.1	166.7		816.6	
Colorado	36	857.8	580.2	13.8	151.0		67.1	12.6	811.5	44.6	19.2	1,119.8	
Florida	3	889.0	749.2	380.0	274.9	27.5	170.5		62.3	149.4		1,064.6	
Illinois	2	551.5	417.6	453.9	324.7	36.1	71.3		3.5	14.7		904.2	
Indiana	1	5.0	0.3		1.2				1.0			2.2	
Kansas	23	4,894.0	2,647.9	98.0	559.4	60.4	203.0		806.1	156.1		1,883.0	
Kentucky	2	899.7	654.0								520.0	520.0	
Louisiana	100	22,601.1	14,070.4	1,474.4	1,810.1	458.6	578.9	1,595.0	6,402.1	980.8	675.2	13,975.1	
Michigan	7	503.4	275.5		46.3	0.7	1.7	4.0	928.0	28.4	1.7	1,010.8	
Mississippi	7	1,003.0	463.7		9.4		8.5	1.5	27.9	6.7		54.0	
Montana	9	63.3	37.8		30.6		12.1	5.0	43.2	8.4	1.0	100.3	
Nebraska	2	27.0	3.7		3.6		1.9		5.0	2.2		12.7	
New Mexico	41	3,625.9	2,210.9	112.8	118.9	0.9	79.7	47.8	3,611.7	36.6	21.0	4,029.4	
North Dakota	9	304.0	177.5		186.9		77.5	8.0	141.2	70.1		483.7	
Oklahoma	103	4,764.9	3,109.9	193.1	607.0	83.8	221.7	608.8	3,598.6	242.7	531.6	6,087.3	
Texas	411	25,089.6	13,380.5	2,597.5	3,626.9	449.0	1,678.7	1,452.6	11,869.5	2,341.8	1,939.9	25,955.9	
Utah	10	520.5	258.2		114.0		27.6	36.5	130.7	48.4		357.2	
West Virginia	4	366.0	256.5	228.0	130.0	22.0	41.0		280.9	1.5		703.4	
Wyoming	42	1,959.1	1,167.4		330.6	3.0	184.7	151.0	280.9	283.5	23.1	1,256.8	
Total	859	70,483.8	41,156.9	5,551.5	8,789.1	1,170.8	3,604.7	3,938.2	29,350.9	4,658.0	4,056.9	61,120.1	

Country	No. plants	MMcfd		Production—1,000 gal day (Averaged based on the past 12 months)									Total products
		Gas capacity	Gas through-put	Ethane	Prop.	Isobut.	Normal or unsplit butane	LP-gas mix	Raw NGL mix	Debut. nat. gaso.	Other		
Abu Dhabi	3	1,518.0	1,028.0		829.1		850.2			857.8	176.4	2,713.5	
Algeria	4	5,335.2	4,268.2					632.8			5,449.2	6,082.0	
Argentina	7	1,059.7	801.7		269.8	4.7	193.4			135.0		602.9	
Australia	3	1,055.0	522.0	395.0	496.9		210.8				746.0	1,848.7	
Austria	2	5.7	4.7						0.9			0.9	
Bahrain	1	110.0	122.6		113.8		94.2			131.3		339.3	
Bolivia	2	474.0	380.0						32.6			32.6	
Brazil	3	195.0	184.0					106.4	197.7	35.9		340.0	
Brunei	1	48.0	40.0		12.5				37.1			49.6	
Canada													
Alberta	320	17,235.1	11,377.8	3,066.5	2,020.8	126.1	1,168.8	1,019.5	2,998.3	3,052.9	1,405.0	14,857.9	
British Columbia	6	1,885.4	750.6		74.5	26.7	58.2	89.6		3.9		252.9	
Northwest Territories	2	197.0	40.6										
Saskatchewan	9	130.5	58.8						72.1		24.4	96.5	
Chile	2	475.0	436.0		203.3		129.9			111.4		444.6	
China, Taiwan	4	271.0	126.0	34.3	38.8	1.0	23.6		9.6	21.3		128.6	
Dominican Republic	1										277.2	277.2	
Ecuador	2							2.4	9.1			11.5	
Egypt	4	553.0	480.0					149.0	1,184.0		464.1	1,797.1	
France	1	1,041.0	938.0		176.0		182.0			473.0		831.0	
Germany	5	542.9	451.0										
Greece	1	26.1	21.4						87.1			87.1	
Hungary	12	725.6	386.7		154.7	14.3	145.9		67.0	162.7	335.9	880.5	
Indonesia	5	592.8	410.4		344.3		161.2	30.0			16.2	551.7	
Italy	14	5,560.0	3,195.0					65.0		426.9		491.9	
Kuwait	1	1,680.0	360.0		834.0		548.0			305.0	85.0	1,772.0	
Libya	7	1,851.0	1,227.0					37.8	5,577.0		551.0	6,165.8	
Mexico	9	3,807.0	3,467.0	3,154.4	7,525.4							10,679.8	
Netherlands	1	330.0	136.0						5.1			5.1	
New Zealand	1	96.0	54.0		21.4		2.9			6.1		30.4	
Pakistan	5	1,215.0	1,092.1					21.3		7.8	3.1	32.2	
Peru	2	84.0	49.0				1.2	10.7		42.8		54.7	
Qatar	2	580.0	240.0		338.0		207.0			153.0		698.0	
Saudi Arabia	5	4,300.0							1,176.0			1,176.0	
Sarjah	1	280.0	280.0						1,050.0			1,050.0	
United Kingdom	5	2,435.0	1,133.0		332.0		291.0			1,748.5	52.8	2,424.3	
Venezuela	13	2,858.0	2,068.0		162.5			730.7	1,491.8	137.8		2,522.8	
Total	466	58,552.0	36,129.6	6,650.2	13,947.8	172.8	4,268.3	2,895.2	13,995.4	7,813.1	9,586.3	59,329.1	

Historical record of reserves

	1974		1976		1980		1984	
	Oil 10 ⁶ b	Gas 10 ⁶ cu ft	Oil	Gas	Oil	Gas	Oil	Gas
ASIA-PACIFIC								
Afghanistan	90	400	—	3 500	—	—	—	—
Australia	2 300	37 700	1 700	32 500	2 130	31 000	1 586	17 682
Bangladesh	—	8 000	—	10 000	—	8 000	—	7 000
Brunei	1 600	20 000	2 000	8 700	1 800	7 700	1 390	7 050
Burma	68	200	—	70	—	135	30	180
India	779	2 000	913	2 400	2 600	9 300	3 485	14 826
Indonesia	10 500	15 000	14 000	15 000	9 600	24 000	9 100	30 200
Japan	19	700	25	1 900	55	600	58	900
Malaysia	—	—	2 500	15 000	2 800	17 000	3 000	48 000
New Zealand	224	15 000	—	5 000	110	6 000	170	5 533
Pakistan	31	10 120	26	16 400	200	15 800	82	15 800
Philippines	—	—	—	—	25	—	16	14
Taiwan	14	400	—	1 000	10	650	6	50
Thailand	10	—	—	—	—	8 000	45	8 500
Total	15 635	109 520	21 234	111 560	19 355	128 185	18 968	156 235
EUROPE								
Austria	157	589	167	775	141	406	122	530
Denmark	249	1 800	245	500	375	2 820	324	2 887
France	80	6 500	88	5 300	50	6 300	140	2 422
Greece	—	—	—	—	150	4 000	51	3 470
Ireland	—	—	—	—	—	1 000	—	700
Italy	212	5 300	347	7 028	645	3 500	800	4 340
Netherlands	251	92 000	250	70 000	60	59 500	309	50 050
Norway	4 000	23 000	7 000	25 000	5 750	23 500	7 660	58 800
Spain	60	500	250	500	150	2 000	160	2 225
United Kingdom	10 000	50 000	16 000	50 000	15 400	25 000	13 150	25 104
West Germany	544	12 308	373	8 300	480	6 350	304	6 800
Yugoslavia	438	1 800	375	1 500	275	1 000	—	—
Total	15 991	193 797	25 095	168 903	23 476	135 376	23 020	157 328
MIDDLE EAST								
Abu Dhabi	21 500	12 500	29 500	20 000	28 000	19 000	30 400	20 500
Bahrain	360	4 000	312	5 500	240	9 000	185	7 400
Divided Zone	17 500	8 000	6 400	7 500	6 260	5 000	5 695	8 307
Dubai	2 500	1 000	1 350	1 500	1 400	1 500	1 440	4 320
Iran	60 000	270 000	64 500	329 500	58 000	490 000	51 000	480 000
Iraq	31 500	22 000	34 300	27 100	31 000	27 500	43 000	29 000
Israel	3	25	2	20	1	100	1	10
Kuwait	64 000	32 500	68 000	31 800	65 400	31 000	63 900	31 000
Oman	5 250	2 000	5 900	2 000	2 400	2 790	2 790	2 810
Qatar	6 500	8 000	5 850	7 500	3 760	60 000	3 330	62 000
Saudi Arabia	132 000	50 900	148 600	103 000	163 350	93 230	166 000	121 000
Sharjah	—	—	1 350	1 450	11	—	500	6 400
Syria	7 100	700	2 240	1 240	2 000	1 500	1 490	1 290
Turkey	450	200	107	538	125	500	370	1 010
Total	348 663	411 825	368 411	538 648	361 947	740 330	370 101	775 047
AFRICA								
Algeria	7 640	105 945	7 370	126 000	8 440	132 000	9 220	110 180
Angola-Cabinda	1 500	1 500	1 300	1 500	1 200	1 175	1 700	1 550
Cameroon	—	—	—	—	140	—	520	4 200
Congo	4 888	1 000	2 450	1 000	400	2 200	400	2 150
Egypt	5 125	4 200	3 900	4 000	3 100	3 000	3 450	7 100
Gabon	1 500	6 500	2 200	2 500	500	500	490	500
Ghana	—	—	—	—	7	—	4	4
Ivory Coast	—	—	—	—	—	—	108	3 020
Libya	25 500	27 000	26 100	26 300	23 500	24 000	21 270	21 350
Morocco	—	25	—	22	—	25	—	—
Nigeria	20 000	40 000	20 200	44 300	17 400	41 400	16 550	34 800
Senegal	—	—	—	—	—	—	750	—
South Africa	—	—	—	—	—	—	115	400
Sudan	—	—	—	—	—	—	300	—
Tanzania	—	—	—	—	—	—	—	200
Tunisia	950	1 500	1 065	1 480	2 250	6 000	1 820	4 150
Zaire	200	50	500	50	135	50	110	40
Total	67 304	187 720	65 085	207 152	57 072	210 350	56 807	189 644
LATIN AMERICA								
Argentina	2 500	8 000	2 465	7 200	2 400	15 200	2 428	24 420
Barbados	—	—	21	—	1	—	1	—
Bolivia	260	10 000	235	10 800	150	5 400	160	4 900
Brazil	799	921	780	927	1 220	1 500	1 800	2 669
Chile	124	3 400	190	2 300	400	2 500	748	2 400
Colombia	1 432	2 500	557	4 000	710	5 090	560	4 300
Ecuador	5 675	5 000	2 450	5 000	1 100	4 000	1 675	3 526
Guatemala	—	—	—	—	16	—	48	33
Mexico	3 600	11 000	9 500	12 000	31 250	58 000	48 000	75 352
Peru	1 050	3 500	770	2 260	655	1 100	775	1 150
Trinidad-Tobago	2 200	5 000	700	4 000	700	8 000	630	13 100
Venezuela	14 000	42 000	17 700	42 000	17 870	42 800	24 850	54 564
Total	31 640	91 321	35 358	90 487	56 472	144 500	81 675	186 396
NORTH AMERICA								
Canada	9 424	50 299	7 100	53 400	6 800	85 500	6 730	90 500
U.S.A.	35 380	249 950	33 000	215 000	26 500	154 000	27 300	198 000
Total	44 724	300 249	40 100	268 400	33 300	279 500	34 030	288 000
COMMUNIST								
China	19 500	21 000	20 000	25 000	20 000	25 000	19 100	30 300
Czechoslovakia	11	500	150	1 500	—	—	—	—
Hungary	1 000	3 000	700	3 000	—	—	—	—
Poland	56	5 000	300	2 000	—	—	—	—
Romania	2 000	6 000	1 700	2 000	—	—	—	—
USSR	75 000	635 400	80 400	800 000	67 000	900 000	63 000	1 400 000
Others	1 43	1 800	150	1 500	3 000	10 000	2 500	16 500
Total	97 610	672 700	103 400	835 000	90 000	935 000	84 600	1 448 800
World Total	621 567	1 967 132	658 693	2 220 150	641 622	2 573 241	669 201	3 199 950